SECOND ANNUAL REPORT

OF THE

PROVINCIAL BOARD OF HEALTH

OF ONTARIO,

BEING FOR THE YEAR 1883.

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1884.

PROVINCIAL BOARD OF HEALTH OF ONTARIO.

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PROVINCIAL BOARD OF HEALTH.

Office of the Provincial Board of Health,
Parliament Buildings,
Toronto, December 31st, 1883.

To His Honour the Honourable John Beverley Robinson,
Lieutenant-Governor of the Province of Ontario.

May it please your Honour :—

The Provincial Board of Health begs leave respectfully to present this its Second Annual Report.

It is a matter for thankfulness and congratulation that during the past year, the Province has not been visited with any wide-spread cause of mortality or sickness, beyond the ordinary causes which have been at work from year to year, which, however this Board thinks should be materially lessened.

In the month of July the suburbs of the City of London were visited by a flood unparalleled in the history of this Province. By this catastrophe a number of lives were lost at the time ; and great danger to life and health was apprehended from the fact that the contents of yards and outhouses, along with large quantities of organic matter brought down by the flood, were washed into wells and dwellings, the houses and their surroundings being flooded and saturated.

It was feared that the vast amount of filth spread over so large an area would decompose, and produce most deplorable results. These were, however, averted by the prompt and energetic action of the citizens and local authorities of London and of the suburbs themselves : which action will be described in detail in the Report and the Appendices thereto.

It will be found that the visitation has not been void of beneficial results ; the greater care and attention paid to sanitary matters will be the means of saving a far greater number of lives than were lost by the flood, painful as the remembrance of that loss is.

Several slight outbreaks of small-pox occurring in various parts of the Province have also been speedily checked by the prompt action of local authorities, not however without a waste of lives which ought not to have taken place had the best sanitary precautions been observed by the friends of the victims and by other persons.

In all the cases above cited, the coöperation of this Board was asked for and obtained. Fortunately, however, the action of the local authorities asking such coöperation was itself so efficient as to leave little to be done by the Provincial Board.

During the summer and autumn, fears were entertained of a visitation of Asiatic Cholera, which appeared to have commenced its westward march. This seems to have been arrested, for the present at least ; whether only for the present, remains to be seen. The apprehension of such a visitation has not been without its good effects. An impetus

was given to sanitary reforms, and in many places much-needed cleansing and purifying have been the result. In this way, many of the lives yearly sacrificed to other filth diseases have been saved. It is here worthy of remark that, throughout our Province, as in most other countries, more deaths are caused yearly by the want of systems for securing thorough cleanliness of streets, lanes, and premises, good ventilation, effective drainage and ventilation of drains, good water supply, isolation of infected persons and careful disinfection than have ever been superadded to the ordinary mortality by any epidemic of cholera that has occurred. We would express the hope that Ontario will not be amongst the last to do away with this unsatisfactory state of affairs.

Any person sufficiently interested in the saving of life, health and wealth, may obtain a fair idea of what may be gained by increased attention to sanitary organization and sanitary reforms generally, by calculating from the figures given in the "Statesman's Year Book," the ratio of deaths to population during the six years before the passage of the English Public Health Act of 1875 and during the six years following that date. He will find on adding the columns of population and deaths as given on page 243 of the volume for 1883, that for the first mentioned period the death rate was 22.09 per 1,000, and for the last mentioned, 20.63 per 1,000. Continuing his calculations, he will find the total saving thus effected in six years to amount to 219,118 lives. In England and Wales alone there were saved a number more than twice as great as the standing army of Great Britian for the same period.

We would be horrified if the British army was destroyed by hostile armies every three years, and yet the people have been carelessly allowing to lurk in their midst invisible foes whose ravages have been no less destructive to life. And we may here remark that these figures are taken from one of the most accurate records in the world, and that they cover in each case a period of six years. We must also remember, that as years have rolled on, the population has been growing more dense.

The Imperial Act of 1875 was the outcome of the formation of the Local Government Board of England, and one of its chief features is that provision is made for the establishment of a Board of Health in every municipal district, apart from the Boards of Aldermen and Councillors already in existence. It was expected that the formation of a Board in every municipality, whose sole duty it would be to care for the health of that municipality, and composed of men elected on account of their interest in sanitary matters, would be the means of saving many lives. How far this expectation has been realized the above figures have partially shown; but the saving, so far effected, will be enormously increased when the various schemes recently instituted for the stamping out of infectious diseases have been fully adopted, as they ultimately must be. People will not forever listen to erroneous nonsense about infringments of personal liberty and interference with business, whilst their children are being needlessly slaughtered by preventable disease. The people are now realizing more fully that life and money can be saved by more efficient sanitary organization.

The remarks which have been made will apply with greater force to the Province of Ontario than they do to England. Many of the sanitary reforms and sanitary organizations which this Board desires to see introduced here had been in existence in many parts of England prior to the passing of the Act of 1875, to a far greater extent than is the case in this country, and it is the extension of them to every district, and the perfecting of the organizations referred to, that caused the saving of life before described. But let us for the present anticipate no more than that by the adoption of similar legislation similar results will follow. This means that it is in the power of the Legislature of this Province to save annually the lives of 2807 persons. We are aware that in this calculation we are very far below the figures given by some of the highest authorities on such matters in Great Britain and the United States, as, for example, Mr. Edward Chadwick and the Hon. Senator Brooks. A reference to calculations of past results, as well as of future anticipations, by these authorities, may be found on p. 119 of the Report of this Board for last year. By the adoption of these figures it may in a long series of years be estimated at more than 6,000 lives annually.

It is needless to say that no money calculation can adequately express what this means. No words of ours are necessary to add to the feelings of any right-minded

persons regarding the desirability from a humane, social, or religious standpoint, of this saving of human life. Nevertheless, the question has its financial aspect, and certain statistics in regard to this may be of some value.

In the article in last year's report, referred to, the money saving ultimately possible in this Province, as based on the statements of Mr. Chadwick, is computed at $9,540,000 per annum. At the end of a period of six years from this date, the annual saving would be nearly $4,000,000. It may then be asked why our Legislature has been so dilatory in enacting the laws necessary to insure the state against the loss of so large an amount of wealth and happiness. In reply, we may say that the Legislature being but the representative of the will of the people, could not run too far in advance, and that the people at large must become educated in regard to these matters, and become convinced of the necessity of sanitary reform, and of sanitary organization. During the past year we have had abundant evidence of the direction the popular will is taking with regard to the public health. This has been shown by resolutions passed at meetings of the medical profession, by those adopted by the general public at various meetings for the discussion of sanitary matters, and by the voice of both the profession and the public, as heard through that most potent and faithful expression of it, the public press.

In Appendix D will be found copies of resolutions passed by the Ontario Medical Association, composed of leading medical men from all parts of the Province; by the Bathurst and Rideau, and other Divisional Associations, embracing still larger numbers of the profession, in the respective divisions within which they are held; by the London Sanitary Convention, a largely attended and influential gathering; and by various Teachers' Associations and Literary Societies throughout the Province.

The pages of all the most influential journals of the Province have, week after week, and sometimes day after day, contained articles, in the shape of editorials, communications, and news items, devoted to the cause of public health. And, whilst noting this general interest in sanitary matters, we have also to thank the press of this Province for the aid given to this Board in connection with its special work. This action of the press must be viewed in a three-fold aspect; first, as reflecting the popular feeling and interest; secondly, as a powerful educator; and thirdly, as a reliable aid in supporting and introducing needed reforms.

Reflecting, then, upon the state of public feeling and the necessities of the case, we would express the hope that your Honour as Her Majesty's representative in this Province, with the consent of the representatives of the people in the Legislature, will, during the ensuing session, follow up the good work of sanitary organization, and will make such further enactments as shall provide for the saving of life, health, and wealth.

It is the intention of this Board to submit, at an early date, certain suggestions regarding the consolidation of the Public Health Acts already in force, and the making of certain additions thereto, in the hope that the suggestions so made may be of some service in assisting in the carrying out of this object.

It would occupy too much time to enter in detail here into all the suggestions which may be proposed. A few of the more prominent may be noticed. First, then it is proposed that there shall be in every municipality a Board whose special duty it shall be to watch over and attend to matters affecting the public health. It is self-evident that men selected for that purpose, and who have paid, or will pay, special attention to sanitary matters, are far more likely to advance the cause of the public health, than those who do not give these matters any such special attention. The saving of life by the adoption of a similar system in England has already been pointed out. To avoid radical changes it is proposed that only one-third of the members of any such Local Board shall retire each year; and it is further suggested that the head of the Municipal Council, and in certain cases the clerk, shall have a seat on the Board. In the case of small or thinly populated municipalities provision is made by which two or more may join together for sanitary purposes.

It is proposed that each municipality, or each such group of municipalities, shall appoint a Medical Health Officer and a Sanitary Inspector. Provision is made for the adoption of such means as shall further secure us against poisonous and unwholesome

food ; especially against meat, milk and water containing germs of disease. And it may here be remarked that the past year has afforded many additional examples of deaths caused in this way.

This remark will also apply to the next subject to which we would allude : the prevention of sickness and death from defective plumbing and drainage. Many cases illustrative of the necessity for reform in this direction have come under the observation of members of the Board. It is not proposed to interfere with any vested rights, but we think that the people should be protected from the ignorant imposition and incompetency of unskilled persons, and should have some guarantee that those hereafter entering upon the occupation of plumbing and house-drainage are qualified to construct drains and plumbing appliances in such a manner that the inmates of dwellings may not be subjected to the death penalty.

Akin to this proposed reform, is another providing the means for obviating the loss of drainage plans. Much inconvenience, pecuniary loss, and insecurity, have frequently been experienced from this cause. It has been necessary to tear up floors and other structures, and dig trenches in all directions, for the purpose of finding and examining drains and plumbing work. We think that means should be adopted providing against loss and inconvenience from these sources.

It is also proposed through the agency of Local Boards of Health to provide against other unsanitary conditions in the construction of houses, thus making the Boards a valuable aid to persons who propose building, and who wish to have their houses constructed on principles conservative of health.

With regard to the proposition for the examination and licensing of such plumbers as shall hereafter enter upon that trade, it is a matter for congratulation that the plumbers are themselves anxious for such legislation. Many masters and journeymen have been spoken to and have expressed their desire to see it enacted. And at the hands of architects, builders, and the public generally, the scheme meets with a hearty reception.

In the year 1873 an Act was passed whereby a "Central Board of Health" may be called into existence by a proclamation of the Lieutenant-Governor in Council, declaring the whole or any portion of the Province to be threatened with formidable epidemic, "endemic, or contagious disease."

By the Public Health Act of 1882, it was enacted that the powers of this Central Board may, in the event of such proclamation being issued, be transferred to the Provincial Board of Health. It has been found by experience that it is inadvisable that such a proclamation should require to be issued. A proceeding of this character is calculated to create unnecessary alarm, and to interfere with the commercial, and other interests of any place ; and, besides, it may involve an unnecessary and injurious delay, as was experienced in one case shortly after the formation of this Board. It is now proposed that the Board may, when it is deemed necessary, exercise the powers referred to without such proclamation.

There should also be some detailed provisions regarding infectious diseases, already covered in more general terms by the Public Health Act of 1882.

It is also desirable to introduce into it, for the greater convenience of Local Boards, some of the by-laws which are most commonly needed, and which will remain in force until modified by the further action of such Boards.

For the purpose of showing the great advantages which will be gained by the carrying out of the legislation now sought, English statistics were brought forward in the commencement of these introductory remarks, and were applied by anticipation to like conditions in this Province. To see how the conclusions arrived at tally with those which may be drawn from our own statistics, and to show what a rich return may with certainty be obtained for the time given by Local Boards of Health, and for the moneys paid to Medical Health Officers, let us examine the last published report of the Registrar General of Ontario. We will there find that the recorded deaths from Diphtheria during the preceding year were 1171; from Scarlet fever 470; and from all those diseases which are readily admitted to "spread" from a first case there was a total of 3000. During the past year the question has been asked of a number of medical men, "Do you think that one half of the cases in your neighbourhood could have been prevented if you had had a

medical health officer, and proper by-laws ?" The answer has invariably been, "Oh, yes, far more than that!" But let us content ourselves with assuming that only one half of these persons might have been prevented from catching the disease by proper precautions and strict watchfulness, and this will give us 1500 persons who might have been saved from death. Consider along with this, how many of the 2397 persons who died in that year from Pulmonary Consumption, might still be alive if better ventilation had been adopted. Add to both these the numbers who might have been saved from death from filth diseases, and from accidents preventable to a certain extent by proper regulations, and to them again, add the numbers of sick who did not die, and we think there will be enough to convince the most miserly and unprogressive of the advantages to be gained by further sanitary organization, and of the urgent necessity therefor.

This Board feels, as was stated last year, that its usefulness is much less than it would be were such Local Boards and Health Officers in existence to receive, and to make practical application of, the results of its deliberations, and to distribute, along with other information, the literature published by it.

Although the Board cannot but feel encouraged by the manner in which its work has been received wherever it has extended, still it regrets this limitation of the practical application of it, and believes that the commencement of sanitary organization in this Province by the establishment of a Provincial Board of Health, must be followed up by the formation of Local Boards in the municipalities.

The work alluded to will be found in the appendices to this Report, and more detailed remarks regarding it in the chapters of the Report itself.

It will be apparent that, in the successive Reports issued by the Board, there must of necessity be much matter of the same nature repeated. At the same time, with the progress which science in its many varied fields is making, many new facts constantly appearing, will require to be examined in their bearings upon the causation of disease, and upon the practice of medical and sanitary science.

The past year has been no less distinguished than its predecessors in the direction to which allusion has just been made; and the prominent place accorded to the principles of Hygiene, not only in the prevention, but also in the tréatment of disease, is very gratifying to those who are labouring in this field.

The Report and appendices are arranged as follows :—

PART I.

Contains the Report, proper, of the Board, arranged under the eight following chapters :—

PART II.

APPENDIX A.

Appendix B.

Appendix C.

Appendix D.

Appendix E.

Appendix F.

APPENDIX G.

APPENDIX H.

PART III.

PART I.

CHAPTER I.

STATISTICS OF DISEASE IN ONTARIO.

While recognizing with pleasure the fact that great progress has been made in medicine and surgery during the last decade, we are equally pleased to observe that Hygiene is every year attracting more and more the earnest attention of mankind. And it is but fair to acknowledge that, while in many instances professional skill has prompted the needed sanitary reforms, in others the work has been done and the benefit to life and health secured through the active intelligence and administrative ability of laymen. As a notable instance of the debt which humanity and sanitary science owe to non-professional effort, we might allude *en passant* to the great sanitary works accomplished in British India, under the direction of Lord John Lawrence. Many of these works, such as railways and canals, were of general utility; others, such as special sanitary reforms in garrison towns, were intended for the benefit of the British soldier. Of Lord Lawrence it has been fitly said that "He attached as much importance to the effective reserve force in a soldier saved from sickness as in one saved from the dagger of fanatical hillsman or fakir."

As a proof of the success of these sanitary reforms in accomplishing the desired end, we may mention that Sir Joseph Fayre, quoting from Indian army statistics, states that the mortality among British troops in that country has fallen in twenty years from 69 to 17.62 per 1,000.

In alluding to the first, and therefore most difficult, efforts made in the compilation of mortality statistics in Britain, the post of honour naturally belongs to Dr. Farr. It was he who began the work which, as the Registrar-General's Department, has reached such noble proportions, and has become a rich mine from which may be obtained important facts indicating the causes of mortality and the effects of various unsanitary conditions in the production of disease. The study of vital statistics and preventive medicine has received a great impetus in Britain since the Registrar-General's Department of England and Wales has become connected with the Local Government Board; and this is owing more particularly to the fact that many young medical men who have studied in the Army Medical School at Netley have endeavoured to put in practice the teaching of the late Professor Parkes.

But, to go farther, it will be at once understood that from the many advantages, which exact description and system, as adopted in the army departments, admit of, it was possible to make an effort to estimate not only the comparative mortality, but also to determine the causes and influences which are powerful in producing disease. British army reports, therefore, in which statistics of disease taken from hospital registers scattered over the known world could be obtained, grew to be of prime importance in the study of climatology.

Dr. W. B. Richardson for a very considerable length of time undertook, with characteristic energy, the collection and study of reports of disease, supplied by voluntary contributors in various parts of the United Kingdom. He informs us that, begun in 1855, these reports were continued for four years without intermission. Dr. Richardson received them from twelve stations, there being one physician of large practice reporting from each place. From these comparatively limited efforts, he was able to gather results of great and varied importance. Other collections have been made, as from the

weekly returns of hospitals and dispensaries. Thus in the report of the Local Government Board of England and Wales for 1868 we have a detailed study by Dr. Ballard of the Records of Sickness for twelve years—1857 to 1868 inclusive—in certain institutions where sick poor are treated in the parish of St. Mary, Islington. In addition to these we have an excellent system of reporting prevailing disease carried on for a number of years past by the State Board of Health for Michigan.

It will be seen in the sequel that, in the work of reporting prevailing diseases which the Provincial Board of Health has undertaken so early in its history, while it is by no means first in the field, it has nevertheless adopted some details in its methods and objects that have not, so far as we are aware, been hitherto attempted. It has already been stated that records of prevailing disease have a special value attached to them, not only absolutely but relatively, as compared with the statistics of mortality. It would seem as if no argument were necessary to prove that such important value attaches itself to weekly or even monthly statistics of disease; but before proceeding to speak of some of the special information obtained from a study of the statistics themselves, it may be desirable that some of the various ways in which such statistics may be useful, be set forth in this the first report of statistics as collected by the Provincial Board of Health.

1. *Value of Statistics of Disease.*—Without presuming to discuss the bearings of the question of the existence of disease through the Divine permission, it may suffice to say, that during all the centuries which have come and gone since the days of Adam, the question of the causation of disease has remained a secret, for the most part hidden even from the most fervent devotees of Hygeia. In the elucidation of so difficult a subject, in so far as it is possible to clear up the mystery, microscopy naturally takes a leading place. Speaking of microscopic pathological anatomy, Prof. Virchow has recently said that "it was the point of departure of a movement, which in a few decades, has changed the whole face of medical science." But with all this there may be an element of truth in the remark made by a recent reviewer that there is a present danger "of having one's mental horizon bounded by the tube of one's microscope." In truth, it must on every hand be felt that this evolving of scientific order and precision, must for a time, at least, be chaotic. To-day we have an apparently new fact, to-morrow it is modified or rejected; but a residuum of truth remains. The scientific mind of to-day is the crucible in which lies at the bottom the button of refined gold. But generalization from imperfect data, instead of elucidating, rather obscures the object of our research. It must, therefore, be patent, even to the most enthusiastic microscopist, that before any accurate knowledge of the causes of disease can be obtained, it will be necessary to pave the way to the acquisition of that knowledge by the accumulation of a vast number of statistics, showing accurately all the circumstances under which disease exists. This is all the more evident when we consider the varied constitutions of men and the different physical circumstances by which they are surrounded and governed.

With the object of aiding such research, by the constant gathering of facts concerning the amount of existing disease, its lateral extent, and persistency; by establishing if possible the relations which such amount, extent, and persistency have to the nature of the soil, its composition and its drainage; to the height of places above the sea-level, comparatively and absolutely; to the influence, if any, of large or small bodies of water, and of the winds from them, and to the influence of forests, either directly or indirectly, the Provincial Board of Health has undertaken the carrying on of a system of collecting and reporting disease, the details of which will be found in Appendix A, Part III. of this Report.

2. *Necessity for such Statistics in Ontario.*—From these general considerations, it naturally follows that we are desirous of information, not only about the more fatal forms of disease, but also about those which though less fatal in their immediate effects, yet leave the body a prey to the former.

For instance, there are scarcely any deaths returned as due directly to diseases of malarial origin, and yet reliable statistics show that malaria is the ultimate cause of death of fifty per cent. of the human race. Again, Anæmia has hitherto been seldom set down as a cause of death, and yet in our weekly reports we find that, taken the year

round, almost as many cases of this disease are reported as of any other. In addition to the value just indicated, which statistics of disease have, as compared with those of mortality, there is another aspect in which they have a still greater value, at least, in so far as they apply to the Province, and not to individual cases.

By reference to Appendix A, the results of the study of these statistics will be found, and there, too, will be seen statements explaining why certain data, appearing in the tables and diagrams, are probably not in accordance with the actual conditions of disease in some localities. There it will be found, that conclusions and inferences drawn, are not asserted to be either wholly correct, as drawn from certain figures, or even that they are always exactly what the figures do teach; but there the Board hopes will be found a study, imperfectly made indeed, but made with an honest endeavour to establish some relations between the statistics of disease, and some of the conditions under which they have occurred. To illustrate how it may well be that certain figures there found are misleading, we find, for instance, that Diarrhœa appears in the months of October, November, July, August, and September, disproportionately large in District III. Now it will be found in the preliminary remarks of Appendix A, that for various purposes of comparison, the Province has deen divided into ten districts. It will further appear by reference to the health maps, that District III is of very considerable extent, and yet it will be found that it has a comparatively small population. There are probably no more than six physicians in the whole district, three of whom are correspondents of the Board. It must at once appear evident that their practice must extend over very large areas of country. Hence any one disease which may be prevalent will appear present in their practice in large amounts. Now it has of course been necessary in this study to adopt some unit for purposes of comparison, and as will be found by reference to Table I, this unit has been the number of correspondents reporting for the month of October, from District IV, this being the most populous and largest district of the Province, and having likewise, the largest number of correspondents in it. It has for the four weeks of October, 65; or more than 15 reports on an average for each week. Now from District III, there have been two regular correspondents throughout the year. Had it been that the total number of cases reported from District IV was eight times as large as that from district III, the comparison of the Diarrhœa of the one, as compared with that of the other, would be just and proper. But, as seen in the tables and diagram, this was not the case. Hence, certain diseases do doubtless appear unusually prevalent in District III, when as a matter of fact, they may not be of more than an average prevalence. Hence, as far as mere numbers go, the apparent prevalence of certain diseases for district III may not really be the correct prevalence, as compared with another and larger district. But for the relative prevalence of certain diseases in the District, the tables would, all other things being equal, be perfectly true. Allowing for the imperfection, it will at once be seen, by reference to the tables, that any disease present in epidemic form, as say, Whooping Cough in June, July and August, is brought out with a distinctness which, for the purposes of study of any one disease, is even more valuable than when the distinctiveness of such disease in a large district is, as it were, impaired by the intrusion of the many other varied cases of disease. Or, to single out but one other case as illustration, we find that the month of October gives, in District VIII, an exceptionally large number of cases of Intermittent Fever. This excess was due in part to the fact that Dr. Dee, of Tuscarora, who is appointed by Government physician to the Indians, reported very large numbers of cases of this disease, both because his practice is very extensive, and because the number of cases which might come under the notice of other physicians in malarial localities is lessened by the large number of persons buying their own quinine; whereas, the Indian, in almost all cases, will apply to the physician.

But, notwithstanding such exceptions, we can assert with perfect confidence, that there are broad general facts brought out by these statistics, which are beyond dispute. For illustration we would select one or two examples. All are aware that Consumption, however it may appear in mortality tables, will, from its lingering nature, show itself in tables of disease as present with much regularity from month to month, as will be found to be the case in the tables given in this report. Again, for similar reasons, and because the source of the disease is one apparently wholly independent of

meteorological or other external influences, Syphilis and Gonorrhœa show little variation from month to month. It is only a fair inference, then, that as the statistics agree in these instances with well understood facts, so will the statistics in their totality, and in the more largely reported districts, at least, be in accordance with the disease conditions actually in existence.

3. *Deductions drawn from the Statistics.*—As already remarked, the Board does not assume to dogmatize concerning any deductions drawn from a study of these statistics, or to affirm that conditions apparently established for this year are true, or to be taken as the gauge of what will occur next year. But much interesting information and many instructive facts have been elicited from the tables, and it is to be hoped will add materially to the stock of accumulating knowledge in regard to the causation of disease. It will be seen that the first condensed table is of five groups of diseases, selected on account of certain evident relations between the individual diseases of each group. With slight deviations, these groups are classified as Class I, Zymotic diseases (zymotici), of the classification adopted by the Royal College of Physicians, London, now almost universally accepted. Without entering here into an analysis of these tables, it may be of interest simply to indicate some of the broad facts which are illustrated by them.

Group I includes a number of specific fevers, and the table shows that they regularly decrease from October to March, when they take a decided rise again, due especially to the rise of Intermittent, which then stands as high as it did in October. From March, they rise steadily up to September, with the exception of a slight decline in the unusually wet weather of June and July. The three subsidiary points to be noticed here are (1) the fact of Intermittent remaining prevalent during the whole of the unusually severe winter weather, and rising to its October height immediately on the opening up of the ground after the winter frosts; (2) the fact that this year Puerperal shows its relationship to Erysipelas, by their both being higher in May than in any other month; and (3) Cerebro-Spinal Fever springing up quite suddenly into prominence in April, rises and falls through the months of April, May, June, July and August, almost regularly with Erysipelas.

Group II, which includes Diarrhœal diseases, shows in the same manner as Group I, a decline beginning with October, which continues only to February; but while a rise is seen to take place in February, yet it is not at all well marked. In fact, Group II shows a remarkably small rise up to July, when, in spite, apparently, of the rains which kept fevers from rapidly rising, Diarrhœas suddenly increase to nearly three times their amount in June. What relations this fact (increase of Diarrhœal diseases) bears to meteorological phenomena, and the consequent changes occurring on and in the soil, is of extreme interest, and affords much food for reflection. As will be found by referring to Appendix A, Table II, there is not more than 1° of difference between the mean temperature for June and that of July, both being 64° F., nearly. Further it will be found that the daily range of temperature for the two months varied but slightly, not being more than 1° F., although it will be seen that it varied slightly in different districts. It will also be found that there is a remarkably close correspondence in the mean humidity and the mean cloudiness for the month, as well as in the amount of rainfall, but more particularly in the number of rainy days for each month. What then are the conditions which can adequately account for this enormous difference in the number of cases of Diarrhœa for the two months? It will be noticed that most of the conditions upon which any great difference in the prevalence of Diarrhœa has hitherto appeared to depend, have been noted above, and it would seem as if we are thrown back on the common explanation, which doubtless has some basis of fact, viz.: that the cumulative debilitating effects of summer weather upon the physical system make it less capable of withstanding the unwholesome agencies which cause Diarrhœa, and also that green vegetables are more plentiful after the first month of summer weather. But is this all that can be said on the subject? Let us see. On referring to pages 40 and 41 of the Appendices, it will be found that, while the total number of cases of Diarrhœa alone amount to 290 in the first two weeks, they amount in the last two weeks of July to 569, or that the latter two weeks have twice as many cases of Diarrhœa as the first two. We have here illustrated in the most accidental way, how valuable, in fact, how absolutely necessary, are weekly reports of

disease in order to approach to something like an exact appreciation of the forces producing them. Unfortunately, no table of the weekly average range of temperature is supplied in the meteorological tables for the whole year, but by enquiry it is found that the temperature for the last two weeks is, in its mean average, no higher than for the first two. It is however found that the rainfall was much less in the second half of the month, it being 1.6 as compared with 2.2 inches. And here we may have a partial explanation of the phenomenon. The influence of the dry weather is still better illustrated in August, as seen in Appendix A.

Group III. of the tables, which includes diseases of the respiratory organs, presumably of a *zymotic* character, excluding Bronchitis, Pneumonia, Pleurisy and Consumption, will be, on the whole, found to follow the course usually taken by diseases of the respiratory organs. Beginning comparatively low in October, they remain almost stationary throughout November, and then make a sudden advance in December, slowly increasing till a maximum is reached in March. Thence the recession, considerable in April and May, becomes very great in June, the total number of cases not amounting to more than half that of May. Their number then remains low during the succeeding months. But while the above are the facts for this group taken as a whole, yet in the case of two—Diphtheria and Whooping Cough—which are usually considered zymotics *par excellence*, it cannot be said that they follow the same course with regard to prevalence, as does the group as a whole. Thus, Diphtheria beginning high in October remains at much the same height till March, when it perceptibly recedes, and with slight interruptions the decline in prevalence continues through succeeding months. Whooping Cough follows through the winter months much the same course, greatly receding in April. Thence, however, it takes another rise, and, excepting in June, remains prevalent during the summer months. What seems quite evident, without entering further into the question at present, is, that these diseases follow other varying circumstances besides those of temperature. However, it must be remembered in connection with both diseases, that the great proportion of cases arise from infection within habitations kept at average temperature. Hence remembering the common disregard for isolating those affected with either, but especially the latter, disease, it will be seen that any theory built upon the supposition that the germs of such diseases multiply in cold weather equally as in warm, would (from the above standpoint) be fallacious, inasmuch as the *culture* temperature is not essentially different at different seasons, but approaches that of the respiratory passages, the inside of dwellings being very largely the place of contact and infection.

Group IV., which includes the three ordinary so-called eruptive diseases, Scarlatina, Measles and Small-Pox, along with Mumps—(grouped here for want of a better place, and because in its modes of appearance and spread it so much resembles the others)—shows a line of prevalence, following in some degree, the course of Group III. Beginning in October with a very small prevalence, it increases by slow ascent till March, when it increases rapidly, reaching its height in April. Thence for two months it slowly decreases, falling suddenly in July to almost its original starting point, and in August becoming even lower. The progress of Measles and Mumps especially affected the total prevalence. Measles rose suddenly into great prominence in March, thence very slowly receding till July. Mumps rising much more gradually, did not reach its highest point till May, whence it fell much more suddenly than Measles, till by September it had almost wholly disappeared. Regarding the two remaining Groups, V. and VI., little needs to be added to what has already been mentioned concerning them. Reference to the tables shows that Group V., including Consumption and other Tubercular diseases, appeared with very slight variations equally prevalent throughout the year. It is, however, interesting, even though it be an accidental occurrence, to notice that the largest numbers of cases of these diseases were reported in the month of August. Group VI., which includes Venereal diseases, does not show more than apparently accidental variations from month to month, no definite rise or fall being noticeable with any season. There are three or four other diseases, such as Anæmia, Bronchitis and Pneumonia, not placed in these groups and remaining separate. Of the two first named much larger numbers of cases have been reported than of almost any other individual

disease. Bronchitis, Pneumonia and Pleurisy, have long been known to be closely associated with cold; while Neuralgia and Rheumatism exhibit relations so close, as regards prevalence, with Bronchitis, that it becomes unnecessary here to refer to them at length.

Such are the broad facts which appear in the study, in a condensed shape, of the statistics of the diseases reported to the Board. It will be seen that many facts are brought out which do not appear in Tables of Mortality. Measles in this country, for instance, we believe, has never appeared amongst the ten most fatal diseases; yet its far-reaching effects in producing various sequelæ, make it both interesting and important to have some clear ideas of its development and prevalence. Mumps, hardly ever appearing in Mortality Tables, becomes a cause of serious results in some cases, and is interesting from the fact of its running in a large degree along with Measles in its prevalence. Similar remarks might be made concerning many other facts which have not been more than indicated here.

It will have been seen that, except in one or two notable instances, the progress of groups of diseases, and of individual diseases, has been associated for the most part, with the single meteorological condition of temperature. By reference to Appendix A, Diagram I., however, there will be found representations of diseases associated with various conditions of the atmosphere such as barometric pressure, relative humidity, rain-fall, monthly average, maxima and minima, and range of temperature. As will readily be understood, by reference to this diagram, it becomes quite impossible to refer in this Chapter to the almost infinite variety of conditions and data there exhibited; and hence, those who desire to make a deeper or more extensive study of these statistics must turn to the Tables and Diagrams and draw such conclusions for themselves as the figures appear to indicate.

In considering the Reports of correspondents regarding zymotic diseases, it may be said that one fact after another points to the great necessity which exists for a radical change, not only in the ideas of the public regarding these diseases, but also, and to a great degree, a change in their every day action where such diseases become to any degree prevalent. Without now speaking of the most difficult of all problems, viz., the origin of the first cases of any of these contagious diseases, the fact must be again and again reiterated, that it is possible to limit such diseases to these first cases, and that a terrible responsibility rests on either physician or householder, if any of the now well-understood precautious for preventing their propagation are neglected. If it be benevolence to equip hospitals, and build asylums; if it be charity to succour the poor, and lift up the fallen; if human progress, and the moral elevation of the race demand the adoption of measures for the prevention of vice and consequent suffering then, surely, duty, justice, and religion require that private individuals, and municipal and state authorities should adopt every proper means in their power to prevent, limit and, even when possible, eradicate such diseases as are infectious in their character, and which experience has proved to be preventable.

4. *Suggestions for Increasing the Efficiency of Disease Statistics.*—In spite of the hackneyed remark, that governmental blue-books are made to be printed and not read, the Board hopes that its report of disease statistics will prove interesting and instructive, more particularly to the medical public. Every thoughtful practitioner in reviewing the past years of his practice, and recording his experience becomes to a greater or less degree a compiler of disease statistics; and his conclusions will be of value in proportion to the accuracy with which any conditions associated with his facts have been noted, and their relations to the facts properly established. Reports presented by the correspondents of the Board must be governed by similar conditions. But in order that statistics may attain their fullest value it becomes necessary to have a sufficiently large staff of reporters, and it is equally important that those reports should be sent with regularity. Regarding the first of these conditions we are free to state that a considerable addition to our staff of reporters is desirable. Respecting the regularity of our correspondents we have little to complain of.

It becomes necessary to refer now to certain suggestions which have been made with the view of improving the system of disease-reporting adopted by the Board. Some of these proposed improvements refer to the list at present in use; others to the adoption of a different basis in the method of reporting. Many correspondents think that a more

accurate estimate can be formed of the origin, progress, and recession of a disease, especially one of an epidemic character, if the reporters would simply record such new cases as may be observed during the week. Cases now continue to be reported long after the cause which brought them into existence may have ceased to operate. For instance, should an epidemic of Typhoid Fever, due to infected milk break out in a certain place, cases of this disease, due to the cause mentioned, would continue to be reported as prevalent long after the cause of the disease had been removed. Without making any radical change in the present method of disease-reporting, which, as far as it goes, gives us a faithful picture of the actual conditions of the Province with regard to disease, the advantages of the other plan may be secured by simply adding to the present form a column with the heading, "New Cases."

The ruling of the blank pages of the counterfoil has been of use by allowing for the reporting of any disease in his practice which a reporter thinks it desirable to note, and which is not found in the printed column. It serves also to give a more accurate idea of the weekly prevalence of all diseases.

In concluding this chapter we would again remark, that we do not consider our disease statistics to be a complete index or all the cases of disease reported during the year, but that it is simply an effort to utilize the accurate though somewhat scanty material which has been placed at our disposal. While it is true that the record of deaths occurring during a certain week and the prevailing atmospheric conditions for the same period can be obtained, still with the present system of mortality returns it is not possible to make a comparative study of this nature until the following year.

It has already been stated that in the matter of causation it becomes very important that the associated meteorological phenomena and the local conditions affecting reported cases be studied in immediate relation to the cases themselves. This has been done in the Weekly Health Bulletin issued by the Board, and published in very many of the newspapers of the Province. Seldom has a week passed in which some remarkable and important fact bearing upon the condition of health at the time has not been noticed; while every weekly report has indicated in the most unmistakable manner that such statistics are necessary. The general interest which the weekly reports have created; the amount of enquiry they have elicited, and the fund of information the public generally have obtained from them, have been amply shewn by the increasing demand for these "Health Maps." Indeed the good resulting from them in the matter of education alone can not be easily estimated; they are as regularly looked for as the weather report, which has now become an indispensable part of daily news. But there is another phase in which the Reports may be looked upon as being of great value. Time and again has information been received through them by the Provincial Board of Health of local outbreaks of contagious disease, which have been closely watched, and restricted by every possible effort. Without affecting in any way, as far as the Board is aware, the commercial interests of a single city, town or village, the public has been warned that this or that disease had broken out, and the attention of the whole Province has been drawn to the fact; all have been put on the alert and in many cases, as the Board has reason to know, municipal authorities, medical men, and the public have taken action where, without such reports, nothing other than alarming newspaper items, in many cases most undesirable, would have made the public aware of the occurrence. But the reports have served a much broader purpose than any of these already mentioned. Reports to the number of fifty, sixty, seventy, and eighty have been received every week from some of the hundred and more gentlemen of the medical profession, scattered over the Province who have undertaken the work of reporting disease, and the public have received every week, the results compiled from these reports. Roughly we may say that every week the public received information concerning one-twentieth of all existing cases of disease in all the Province, which came under the notice of the physician. In other words, making allowance for the varying extent of the practice of different correspondents of the Board; for the varying nature of the cases coming under the notice of one physician as compared with those of another, and of the many incidents casually affecting any one report, we have really only one-twentieth of all the existing diseases recorded. But we have some seventy-five various possible conditions,

under which disease exists, reported to the Board, and have an average taken from those seventy-five possible varieties of conditions. Hence, it seems only fair to conclude that from these data we obtain an accurate statement of the average health conditions for the Province, taken as a whole, at least so far as regards the diseases on our list, and we may state *en passant*, that the list comprises most of the diseases from which information of a practical nature may be drawn.

Assuming what we have stated as a basis for calculation, that one in twenty of the total number of practitioners in the Province reports to this Board, then one-twentieth of all such cases of disease coming under the notice of the profession, are reported every week, and taking, as is actually the case, an average of 2000 diseases reported, we shall have constantly sick throughout the whole year, 40,000 persons in a population of less than 2,000,000. In other words, taking the population at the latter figure, we have constantly ill, one person in every fifty of the whole population. If we continue such a calculation by assuming, further, the cost for medical services of 40,000 such persons for the year to be, at the very lowest calculation, $100, we have $4,000,000 of capital annually abstracted from productive channels, for the purpose of supplying 40,000 persons with medical attendance. But the actual facts are very much worse than this appears to show, since it is not the same 40,000 persons who are constantly ill, for the list of the sick is constantly changing; while we have a right to assume, that many of those who have been ill have been thereby rendered for the future less vigorous. Moreover the material loss is much greater than appears at first sight from this calculation, for we must remember that in a population of 2,000,000, there will not be more than one in four who is a producer of material wealth; and therefore we have $4,000,000 abstracted from the earnings of half a million men, and absorbed in the payment of expenses for medical services and other necessaries. This one simple calculation, which in all probability is much below the actual facts, amply suffices to show what, in an economic sense, is the loss which disease entails upon a nation.

5. *Methods Employed for the Collection of Disease Statistics.*—This has been in part indicated in the preceding section; but, inasmuch as many persons have made enquiries as to the system adopted, and as there are doubtless many other persons, laymen as well as physicians, who are interested in the work, a summary of the plan as described in the Report of 1882, may very properly be given here. On page xxiii. of that Report may be found the form of a circular which was sent to a number of medical gentlemen in various parts of the Province. In it were stated the objects of the scheme, and the gentlemen to whom it was addressed were invited to co-operate by becoming weekly correspondents of the Board, and reporting to its Secretary, on printed forms, the prevalence of various diseases in their practice. The form of blank supplied to them, a fac-simile of which can be found on page 107 of the Report of 1882, includes thirty-nine diseases which the Board deemed of the greatest importance and interest. Experience has proved that there are several diseases which might have been profitably added to the list. These blanks are supplied stamped, and a case book is also sent to each correspondent. It is only necessary for him to enter opposite each disease the number of cases which have occurred during the week, seal it, and post it to the Secretary of the Board, to whom it is addressed. All this seems simple enough, but in practice the work has been one requiring very great patience, perseverance and persistency on the part of the Secretary and his assistant.

The Province was, for purposes of comparison, divided into ten Districts, the special differences between which will be found detailed under Part II., Appendix A, of this Report. Besides the work of obtaining a sufficient total number the task was attempted, and in most cases successfully effected, of enlisting as correspondents gentlemen whose respective residences should be so distributed throughout the various districts, that the reports might be taken as a fair showing of the state of health of the whole Province. The list of the correspondents, their places of residence, and the population of each district will be found in the above mentioned Appendix to the Report. From the list it will be apparent that the number of correspondents in each district is fairly proportional to the respective populations.

6. *Difficulties in Obtaining Statistics.*—It is hardly necessary to remark that whatever has been done in the matter of reporting disease has been done voluntarily

on the part of correspondents. The reasons for this were given very fully on page xxx. of the last annual report, so that they need not be again referred to. It suffices to say that such voluntary method, although it is under the circumstances the only possible method, means imperfect results. But whether such results are less perfect than would be those following the payment of a necessarily small number of reporters, is a matter open to question. However this question may ultimately be decided, there can be no difference of opinion as to the great obligation of the Board and the public to the gentlemen who have so kindly acted as correspondents, many of whom are already so burdened with professional work that to fill in a report, even though it takes but a few moments each week, becomes a weekly task. Hence, the Board has great pleasure in taking advantage of this opportunity to express its own sense of obligation to these gentlemen, and would, at the same time, remind them that this is one of the methods in which they are helping on the work to which all or most of them are so truly devoted, viz., the advancement of Medical Science. It would further express the hope that as they have so unselfishly begun this work they will, by their perseverance, give it a value which it cannot obtain in any other way; for this work, although beset with so many drawbacks, has been, in many ways, most successfully carried on during one year; and broad generalizations can only be drawn from a continued series of annual reports of diseases. That the weekly disease statistics submitted in this report are, from the circumstances of their collection, necessarily imperfect the Board is ready to admit; but it indulges the hope that from their study, even as they are, much useful information may be gleaned.

CHAPTER II.

INVESTIGATIONS INTO THE CAUSES OF, AND REMEDIES FOR, VARIOUS OUTBREAKS OF DISEASES REPORTED TO THE BOARD.

During the past year the Board has not had occasion to appoint any commissions to investigate disease, excepting one undertaken by the Secretary, who was requested to report on the prevalence of Malaria along the valley of the Grand river. Nevertheless it will be seen by reference to Appendix B, that the Board has been consulted about various outbreaks of contagious diseases. Owing, however, to energetic local action, these were suppressed without any active measures being necessary on the part of this Board.

It is indeed very encouraging to know that in the suppression at least of Small-pox, local authority is most active and successful. Within the year four separate and distinct outbreaks of this disease have come to our knowledge, and in none of them, excepting that amongst the railway employés on the Thunder Bay Branch of the Canadian Pacific Railway, did the disease extend beyond the first cases observed. Hence, we find that in spite of its virulence, Small-pox is practically under control and has no permanent existence in this country. The total deaths from it in a population of nearly two millions, do not reach a dozen. Nor can it be said that this has been due to the prophylactic influence of vaccination, since, although this is of the greatest possible importance, the efficient agents in these instances were isolation and the adoption of disinfectant precautions.

But while it is most gratifying to observe the activity of every class in endeavouring to stamp out Small-pox, we regret to be obliged to record their indifference to the other contagious zymotic diseases, which year after year claim many victims from every circle in the community, and their inactivity regarding them. Some of the reasons which may account for this indifference may here be stated.

In the first place, these diseases do not generally appear so loathsome, and do not excite that feeling of horror which makes people shudder and turn pale at the name of Small-pox. For a similar reason, more has been written during the past year, concerning one case of Leprosy reported to have landed in New York, than concerning the ravages of Diphtheria which have made themselves felt in almost every hamlet in the land.

In the second place, most of those diseases of which Diphtheria may again be taken as an example do not in their ordinary outward manifestations impress people with the idea that they are serious.

Thirdly, the fact is not firmly impressed upon the minds of the public, that such diseases are communicable, and that their spread can in large degree be prevented by isolation and disinfectant precautions.

Fourthly, there is a totally inadequate idea of the causes which directly promote their beginning and development.

And, finally, the idea has firmly seized the public mind, that everyone must have Scarlatina, Measles, Whooping Cough, &c., and that people had better have them over while young.

Now it seems hardly necessary here to do more than indicate the great importance which must be attached to the work which the Provincial, and in still greater degree, the Local health authorities have to do in eradicating these ideas. Surely when it is known that such diseases are slaying their hundreds. and leaving most serious effects upon thousands, it behooves those whose duty it is, to see that effectual precautions be taken against their unrestricted spread.

1. *Investigations into, and Remedies for, various Outbreaks of Diseases.*—It will be found by reference to Appendix B. that early in January a very serious outbreak of Small-pox occurred in a shanty on the line of the Canadian Pacific Railroad, some 40 miles from Port Arthur, Thunder Bay. The disease appears to have been introduced by a navvy, who had arrived from Winnipeg. The assistant physician of the railway at this point, diagnosed the disease as Small-pox; but as he did not see the man till after death, and as it had not hitherto been anywhere in the neighbourhood, doubt was cast on the correctness of his opinion. The rumour, however, got abroad amongst the other men of the shanty, and a number of them suddenly left, before measures were taken for detaining them. It will be seen from Dr. Smellie's report, that everyone of these afterwards became, in the most remarkable way, a centre of infection; while the noteworthy fact appears, that those who were detained, and were placed under strict surveillance and vaccinated, escaped in large measure from the most serious effects of the disease. Another fact appears which has been frequently observed by other physicians, viz., that a severe type of Chicken-pox had been previously prevalent in the district.

The period of incubation of the virus was marked in the most exact manner: in the case of those who had left the shanty, the time of exposure, viz., the 3rd or 4th of January, and the time of subsequent invasion of the disease, about the 15th and 16th of January, could be accurately noted. Indeed the very fact of the existence of the usual incubative period, became a cause of fatal consequences, inasmuch as the fact, that the men who had escaped remained well for a week or more, lulled the people at Port Arthur into a sense of false security. From the full reports received from Dr. Thomas Smellie and Dr. James Clark, Sheriff of Thunder Bay, the following points seem to have been made clear:—

1st. That close relations exist between Chicken-pox and Small-pox, probably owing to the fact that the conditions favourable for the one are those serving for a free development of the other.

2nd. That danger of Small-pox becoming epidemic arises either from a false diagnosis of the first case or from the selfish interest of those whose business may be unfavourably affected, and who are ready to accuse the physician of creating unnecessary alarm. This fact will also be seen in the report of the case at Claremont.

3rd. That isolation and disinfectant precautions, thoroughly enforced, are sufficient to stamp out an outbreak of the disease, if applied to the first cases.

4th. That vaccination modifies, in a very definite manner, the susceptibility to the disease; and that it greatly lessens its severity.

5th. That the mortality from the disease, in outbreaks at the present day, does not seem to be less than in former times, at any rate in persons who have not previously been vaccinated, since a very large proportion of those first affected, and who were unvaccinated, died.

Such, then, are some of the facts, gleaned from the inquiries made into the epidemic at Thunder Bay.

Regarding the next outbreak of the disease, also reported in Appendix B., little need be said. Through a correspondent of the Board, information came to the Secretary, that several cases of Small-pox had broken out in Peterborough, and measures were at once taken for ascertaining its extent. It was found that the town medical officer, Dr. Kincaid, had taken prompt action, in isolating the cases, and using disinfectant precautions. The disease proved to be of a mild type, and there were only two or three cases. It is very desirable, in the interests of the public in general, that such outbreaks be immediately communicated to the Provincial Board, in order that it may not only be prepared to assist the local authority in meeting the emergency; but, also, that it may take such further steps as may be necessary to prevent the spread of the disease.

The third outbreak, likewise noticed in Appendix B., is aptly illustrative of the difficulties which any practitioner may meet with in the event of the occurrence of a single case of the disease. It would appear, from the reports, that several cases of Chicken-pox had occurred in the family of a farmer, and, that subsequently, a case of Small-pox appeared, in the person of a labourer employed on the farm. That it was a case of Small-pox seems clear, from the testimony of three medical men, although the

statement was industriously circulated that it was nothing more than a case of Chickenpox. The reason for this appears evident in the statements made in some of the letters published in the correspondence. Much credit is due to Dr. W. F. Eastwood for his energetic action in this case. Had the diagnosis been incorrect, or had he allowed any doubts existing in his own mind to be strengthened by the general scepticism of those around him, serious consequences might have resulted. But isolation and the extreme care taken to prevent any infection from being carried from the patient to others, proved again amply sufficient to restrict the outbreak to this single case. A general vaccination of those who might in any way have been exposed took place, and thus the protective precautions taken seem to have been complete.

Concerning the isolated case said to have occurred recently in Toronto no particulars have been received. The case was apparently a mild one.

Passing on to outbreaks of other contagious diseases, it may be stated that Measles was by far the most prevalent during the year. Yet, though present in various districts, not many fatal cases were reported to this Board. But a difficulty in arriving at any conclusion as to its fatality is due to the fact that its most common sequela, Bronchitis, would be reported under the head of that disease.

As is well known from the history of epidemics of the disease in other countries, filthy surroundings increase its fatality. It is much to be regretted that such apathy and apparent indifference exist concerning this disease and the restriction of it by isolation. However, in an outbreak of Measles which occurred a short time ago in Hamilton, such effective precautions were taken by the principal and other teachers, along with the medical officer of health, that it was unnecessary to close the schools. It may be stated that a Dundas correspondent of the Board, reporting, as he did, for several weeks a very large number of cases, stated in one report that the disease was decreasing, apparently beeause there were no more children to take it.

Remarks similar to those made in the letter of Dr. A. H. Walker regarding Measles, are applicable to most other places where that disease has been present; and nothing more than the remarks of Mr. G. A. Dickson, Principal of the Hamilton schools, is necessary in order to show to what purpose restrictive measures may be used in regard to it.

No reports of the prevalence of Scarlatina to such a degree as to constitute an epidemic, have been received during the past year, excepting that of an outbreak in the Township of Vaughan, which is inserted in Appendix B. But reference to the Tables and Diagrams will show that this disease has been present in many localities to some extent. It has often been remarked in Great Britain and even here, that such epidemics seem to have their periods of growth and decline about every five years. This is partially explained on the ground mentioned by Dr. A. H. Walker concerning Measles, viz., that the disease must decline when it has no more material to feed upon, which is the case when the younger portion of the population—the children—have all suffered from its ravages at any particular time. Hence, the present year has been one of small prevalence of Scarlet Fever, because of its great prevalence during 1880 and 1881. Its contagious nature and methods of propagation are essentially those of the eruptive diseases generally, whose fatal effects are too well known to need to be described here.

So important, indeed, have become the preventive regulations concerning this disease in Great Britain, that many urban health authorities have established hospitals for the reception of patients suffering from it, and so satisfactory have been the results of hospital treatment of the disease (*vide* page 16, of the First Annual Report of this Board), and so high is the people's appreciation of their value, that the calls for such hospitals are daily becoming more frequent.

Regarding the Vaughan outbreak, the remarks made in the letter are amply justified by the facts therein stated. A first case dies in thirty-six hours after taking it; a second in fifty-six hours; and two others were affected at the time of writing. The dead body of the first victim was exposed for three days to the gaze of sympathizing friends, and had a *public funeral.*

By reference to the Mortality Tables, it has been found that Typhoid Fever and Diphtheria were last year the most fatal amongst those Zymotic diseases which are communicable from one person to another. It will further be noticed in the Statistical

Tables and Diagrams, Appendix A, that they were very prevalent at various times and in different localities, during the past year. Hence, we shall doubtless find that for 1882 the Mortality from these two has again been large. Typhoid, during the year, has been reported as present almost everywhere, with here and there, for longer or shorter periods, a large number of cases. This fact, from a sanitary standpoint, has more practical value than the presence of an epidemic in any single town or village, since it shows the almost universal presence of those unsanitary conditions upon which the continued existence and prevalence of Typhoid has long been known to depend. But, while this is true, the fact nevertheless remains, that the occurrence of the disease in this way does not produce a desire for special inquiries as to its cause.

It will be remembered that in the First Annual Report of this Board, reports of three distinct investigations into outbreaks of the disease were published; but during the present year the Board has confined itself to communicating with local health authorities, and furnishing them with its pamphlets "On the Disposal of Sewage," "How to check Contagious Disease" and "By-laws suggested for the use of Local Boards of Health." A reference to the correspondence about the various outbreaks, will show that some of the cases fully illustrate the unsanitary conditions found in so many houses therein referred to.

A correspondent writes:—"The cases of Typhoid are all at present in one family. The father died in ten days, and now two boys are down, with the prospect of one or two more being soon laid up. The supposed cause is water poisoned by kitchen slops, and waste being thrown close to the well and draining into it." The action taken in consequence of the prevalence of this disease in this town was, as will be seen in the letter of the Mayor, the formation of a Board of Health.

Regarding outbreaks of Diphtheria there has been during the year more correspondence, and the facts in connection with its spread have in several instances been obtained. Air and water contaminated with decomposing organic matter have in almost every instance been present in some specially noticeable form. In one, that of a school near Grimsby, the outhouses and surroundings were in a lamentably filthy condition. Of the epidemic at Farren's Point, on the St. Lawrence, no particulars have been obtained. And in that at Easton's Corners, a new source is mentioned—the accumulation of the waste of products from a cheese factory, the decomposition of which produces results similar to that of animal organic matter in general.

The constant relations existing between Diphtheria and decomposing filth of various kinds, are seen in the prevalence of an epidemic of the disease in a village, with the single main sewer of which almost all the villagers connected their house-drains, without any precaution against the accumulation of deposits in the drain and a subsequent passage of the gaseous products of their decomposition into the houses. In another outbreak in which several fatal cases occurred in one family a correspondent informed the Board that members of the family were engaged in the nursery business, and that hotbeds made of manure were situated very near the house.

The general ignorance of the infectious character of the disease and the precautions to be taken against its spread, are so well illustrated that the wonder is how so many escape its ravages. Among the instances supplied to the Secretary by some of the correspondents of the Board, is one, where a servant, returning from visiting her family, conveyed the disease to a child of her employer, and another, which illustrates the poisonous effects on the system of bad surroundings, there being at the same time in one family a father sick with Erysipelas, a mother with Puerperal Fever, and a child with Diphtheria.

Such, then, is a short account of some of the more noticeable outbreaks of Diphtheria during the year. Whether or not it is to continue ever thus, is largely in the hands of the people and their Local Boards of Health to determine. Eternal vigilance is the price of health as well as of liberty.

The Secretary has reported the prevalence of Malaria along the valley of the Grand River. The full report, which will be found in Appendix B, shows that Malaria in that region is a question of prime importance, affecting, as it does, the well-being of a large population. Many are aware that this region is one of the oldest settled parts of the Province, and that Malaria has been prevalent in it at least from the time

that the dams were built on the river at Dunnville to supply water to the Welland Canal; and that in the flat County of Welland Malaria may be said to have been very prevalent ever since its settlement. The experience of Great Britain and other countries goes to show that thorough drainage helps greatly to free such districts from Malaria. Though, doubtless, the valley of the Grand River has some conditions, to a small extent, similar to those of the flat district, still, inasmuch as the banks of the river are high in most parts, it seems somewhat strange that Malaria should still prevail to the extent it does. One question to be decided is, whether the holding back of the river water to a height considerably above what it would stand at if the dams were removed, is the all-sufficient cause of this prevalence or only the exciting cause. Reference need only be made to the proportion which Intermittent Fever bears to the total diseases reported from that district, in the Tables in Appendix B, abstracted from the Statistical Tables of diseases found in Appendix A, in order to show what hold the disease has on the people. Among the Indians of the Reserve the disease, as shown by the reports of Dr. Dee of Tuscarora, Government Physician to the Indians, prevails to a degree which is simply enormous; and certainly it cannot be said that the Reserve land is of a low-lying or marshy character. All of the physicians, whom long experience has made familiar with the various phases of the disease along the river—unless it be Dr. Dee—unite in asserting that it is not nearly so prevalent at the present day as it was fifteen or twenty years ago; while older settlers describe, in most pathetic language, the frightful conditions prevalent for a long time after the construction of the dams. Briefly, there were, apparently, three conditions which in the earlier history of the district made Malaria prevalent. First, the fact that the virgin soil, heavily timbered, was composed of very large amounts of vegetable organic matter; second, that the waters of the river very frequently flooded the flats which occur at many points along its banks and, receding more slowly than they do at present, would not only, for a longer time, aid in the decomposition of the organic matter already present, but would also be less able to remove the detritus borne down by the spring and autumn floods; and further, in the dry season of the late summer and earlier autumn months, conditions peculiarly conducive to the production of Malaria would be present; and thirdly, the conditions mentioned in the second place are just those which would prevent the drainage of lands lying further from the river, and thus the evil effects of underground water standing at a high point throughout the whole year would be present, not only in the immediate vicinity of the river, but back from it to a much greater extent than is the case at present. The same thing would happen along the streams there emptying into the river, many of which are now hardly noticeable, except in the season of the heavy rains.

Now, what have we remaining of these conditions to account for the still large prevalence of the disease?

It may fairly be asserted that there is in a large degree an absence of the first condition, viz., an exuberant vegetation along the river. Time has reduced this to a great extent through constant decomposition, aided by the efforts of the agriculturist in exposing the soil to the oxidizing action of the air. There is also a partial absence of the conditions by which the water was long kept high along the river, and at the same time it must be equally true that the vegetable detritus borne down by the spring and autumn floods and deposited on the flats by overflows, is infinitely less in amount than it was then. The present drowned areas of land are of comparatively small extent, and may be said to be limited to the few miles immediately above the dams at Dunnville. We have remaining only in a small degree the conditions mentioned in the second place, and hence must fall back upon those in the third place, and these only in part. Hence it will appear that the conditions now actually present are, very limited areas of drowned land, flats with comparatively small amounts of vegetable detritus strewn over them by overflows, and in greater or less amounts ground water, more or less near the surface, and prevented from draining away, to the extent it would, if the water were lower.

We would next refer to the almost complete destruction of the forest along the valley of the river. The forest area of this region does not probably amount to more than twenty per cent. (*vide* Report of the Agricultural Commission), of all the land, while immediately along the river there is practically none at all to stay the lateral distribution

of whatever miasmatic influences tend to spread from the immediate neighbourhood of the river. But, while the advantages of forest land in mechanically preventing the free lateral distribution of miasma must be apparent to all, certain other influences which its presence exercises on climate and health, require a fuller notice at our hands. Briefly stated, they may be summed up in the following manner :—

1. Regions deprived in great degree of forest, have their soil much more rapidly heated by the rays of the sun than they otherwise would. The physical causes for this are discussed at length in Appendix B.

2. In like manner, and for the same reasons, such soils are more rapidly cooled down when no longer subject to the influence of the sun's rays.

3. (*a*) From these causes it follows that the daily range of temperature in such cases is very markedly increased over that in a well wooded area. (*b*) These causes tend to lessen, in the periods of greatest heat, the regularity of the rainfall as well as its total amount. (*c*) It follows that they aid the drying out of the soil, and especially of its upper portion. This results in the free dissemination in the air, of dust from the surface of the dried soil, over which the wind passes, carrying with it the specific germs which, it is assumed, are productive of Malaria. A fuller discussion of this point in its bearing on the prevalence of zymotic diseases generally, may be found in Appendix B.

It is well-known also, that with the heating of the soil, by the sun's rays, and to a less degree, the surface of the water, the radiation of heat from their surfaces becomes rapid in proportion to the amount of heat absorbed by the soil or water. Hence we have currents of air constantly and rapidly rising from heated surfaces, and dust particles are constantly carried along with water-vapor by these ascending currents. From experiment it has been proved further that the wind can even carry up living microscopic organisms with the particles of vapor from the the ruffled surface of areas of water, and hence, in all probability marshes, even when not wholly dry, yield to winds specific malarial germs. Again common observation and more exact scientific experiments, such as those recently conducted by Tyndall, have proved that the reverse of these phenomena follows the declining of the sun's rays. As rapidly as the earth was heated it radiates its heat into space, and thus by sundown the air in contact with the earth is practically of the same temperature as the earth itself. But at the time when the surface of the earth begins to cool, the return current of air has begun to set in towards it, and hence the vapor and atmospheric dust are no longer carried off, but some of those particles which have been so borne upwards during the earlier part of the day, will return in greater or less amount earthwards, so that there will be as it were, an extra accumulation in the strata of air near the earth, of much of what has been given off from soils, marshes, etc.

Various well-known facts proving the correctness of this theory may be seen in the following illustrations: it has been often noticed that, in the neighbourhood of fat-rendering establishments, and other manufactories emitting offensive effluvia, very little disagreeable odor is noticed during the day, but about night-fall there seems to be an accumulation of odor near the ground, at varying distances from the manufactories. The air heated by the furnaces of the establishments has caused an upward current bearing the disagreeable odor with it. This air gradually becoming cool, descends often at considerable distances from the factory, while nearer places may be largely free from it. The same phenomenon has been noticed near acid manufactories, viz, that the vegetation a mile or two away is more injuriously affected than that near by.

In discussing the causation of malaria, then, these facts are worthy of consideration. It has long been known that those exposed to night air are much more likely to become affected with Malaria than those who, during the day, are living in the same neighbourhood. The explanation usually given has been that the ill effects are wholly due to damp air ; hence the theory that Malaria is nothing but the depressing effect of cold air on the nervous system. Without wishing to dispute this theory, which, however, is far from explaining many facts connected with Malaria, it is not unreasonable, in the light of modern theories, to think that the accumulation in the lowest stratum of air of multitudes of organisms will serve to account for the injurious effects of night air on persons exposed to it. The simple fact, often quoted, that a fire in a house in a malarial region, in the evening, prevents the inmates from taking Malaria, would seem to be explained on the

same grounds of an upward current of warm air preventing the accumulation of a germ-laden atmosphere within the habitation.

In Appendix B, will be found reference to another element studied in relation to its influence in the causation of Malaria, namely, the ground water. Without discussing its details here, it may be mentioned that the height of the sub-soil or ground water at various periods of the year has long been looked upon as one of the most important factors in the degree of prevalence of Malaria in any district. This has been particularly remarked upon since Bühl's and Pettenkofer's experiments; and from the fact that this water remains in flat and malarial districts without having to any great extent an underground lateral movement, and hence becomes very stagnant, it has been assumed that it is this stagnation which largely determines its injurious effects. But looked at closely, it would seem that it is not so much the condition of the underground water as of the underground air, which plays the important part. The amount of this must depend, other things being equal, upon the height of the sub-soil water and the capacity of the soil for retaining, by capillary attraction, water within its interstices, and so preventing the circulation of air in the sub-soil. By Pasteur's experiments in the investigation of *charbon*, it has been shown that specific bacilli are capable of living and developing at a distance of some feet below the surface of the ground; but all experiments go to show that the decomposition to any extent, of organic matter in the soil, depends mostly upon the amount of oxygen which reaches it through ground air. This will largely be measured by the amount of carbonic acid in the air of the soil. Now, regarding the bearing of the question on the malaria problem, it may be asserted that there are three elements which go to determine the amount of malaria in any given season. The first relates to the amount of organic matter in the soil. There is hardly any soil so limited in the amount of this as not to be under other favouring conditions capable of developing Malaria. The second is the degree of saturation of the soil. The third point is the one immediately determining the product of malaria, viz: the length and degree of the period of drought after a wet season. Long experience has shewn that a wet period in early summer is followed by much or little Malaria, according as the later summer months are dry or wet. In other words, this seems to mean that the moisture of the wet season with the summer heat supplies conditions favourable to vegetable decomposition; but, in order that it can go on to any great extent, the sub-soil water must recede sufficiently to allow the development of germs. Should such a dry period continue, with a repetition of wet for a considerable time, Malaria from this source will grow less, both because of the decomposition of organic matter having become more or less exhausted, and because there is an absence of that moisture in the upper soils by which such decomposition is so materially aided. Now, taking the other instance, we may have both the wet and the heat, but the wet weather in the later summer keeps the sub-soil water so near the surface that extensive decomposition does not go on because air does not gain access to the soil. Primarily then on the supposition that the drying of the surface soil allows of the carrying into the atmosphere of the germs of Malaria, it may, both from fact and analogy, be fairly inferred that the ground air, rising from the ground by its becoming greatly heated during the day, and becoming denser with the rapid cooling of the ground at night, has a regular daily circulation, and carries with it from the soil the germs of specific diseases as well as the spores of such fungi as may be developed there.

Regarding what might best be done to decrease the amount of malaria on the Grand River, the lowering of the river would, by doing away with the conditions referred to in the preceding remarks, aid in decreasing it; drainage, wherever admissible, and where there is stagnant ground water near the surface, would still further serve to lessen it, and finally, the replanting of forest trees in a judicious manner would materially promote the removal of conditions which, as we have seen, have, in a great degree, been created by the wholesale deforesting of the region, and which apparently are prejudicial, not only to the agricultural interests of the district, but to the still higher interests of the public health.

2.—*The Authorities for Conducting Investigations.*—By reference to the action of Government Health Boards in Great Britain, the United States and elsewhere, it will be seen that one of their chief functions is to investigate the causes of disease, and to

remove them if possible. On the formation of the Provincial Board of Health, one or more sections of the Act were devoted to directions for the conducting by the Board of such investigations. If the Board learns through any medium that disease of a serious nature is prevalent in any locality, it may institute an enquiry into the causes producing such disease. It will be seen, however, that in order to make such enquiry of practical value, powers should exist whereby the causes of disease, when discovered, may be as soon as possible thoroughly removed. It is most natural that such action be taken by local health authorities. Unfortunately, however, with a few exceptions, these bodies have only a nominal existence. Satisfactory results will not be obtained till we have such legislation as shall secure to every district its local health organization, with its work well defined, and the organization itself properly equipped for doing it. Moreover, the Provincial Board ought to be authorized to see that local authorities take action where necessity for it has been amply proved. Till then the authority by which the Provincial Board conducts investigations is in a large measure ineffective, and the results of its labours must in proportionate measure be barren of good results. If the reports of the investigations already held be examined, and enquiry be made as to the results following from them, it must be evident that a large link is wanting between the power which advises and some power which ought to perform.

3. *Difficulties Surrounding Investigations.*—It may not at first sight appear that there is room for any remarks under this heading; but it only requires a little thought to understand how many difficulties hamper the carrying out of any investigation.

There are, in the first place, all the difficulties already mentioned in Chapter I, attending investigations of scientific questions of every kind. The relations between cause and effect in any question of disease are in the nature of things difficult to understand thoroughly, as the severe labours of many eminent workers have shewn.

But when it is remembered that the present organization and equipment of the Board is such as to preclude any of its members devoting his whole time to its work, it will be seen that difficulties are thereby much increased. It will be apparent that this can only be remedied by the adoption of adequate measures. The first of these is the employment of some one or more of the members of the Board in the special work of investigating the causes of outbreaks of disease, and the setting apart of such moneys as will supply them with means for carrying on their investigations. It requires no argument to make the scientific and medical public understand that such investigations must be carried out in a comprehensive manner, if permanently good results are to be obtained. It is evident that the investigation of any one outbreak of disease, must often require prolonged and persevering labour to trace the minute details, connected with each case, the surroundings, and the varying influence of different conditions.

In some cases too there are prejudices to be overcome, and selfish interests to be encountered by the investigator. It is truly surprising how jealous some places are of their reputation for healthfulness, while they will yet refuse to expend time or money for the preservation of what they so much prize. A town will allow Typhoid Fever or other disease to be prevalent in it for months without appearing impressed by the fact; yet if a report, by any chance, reaches the outside press, indignant protestations of innocence are immediately published and emphatic denials at once issued. In this there is of course a worthy motive, viz, that of supporting the credit of the town or city, even as one would that of his country.

A great difficulty arises also from the fact that people have become so accustomed to think that disease and death, from causes which sanitarians have proved to be preventable, must be, simply because they have been, and that they do not think it just that the commercial interests of their town or city should in any way be injured, even though these diseases do prevail there. They argue on the principle, that if their town is sickly to-day, some other will be as bad to-morrow.

This idea and mode of reasoning has aptly shown itself in many of the answers given to a circular of questions found in Appendix C., which was addressed to various municipalities, asking for certain sanitary information. It is wonderful how little certain people may know regarding some very ordinary subjects; and it is still more marvellous how defective their memories and faculties of observation are, when they think it convenient

not to exercise them. On several occasions the Secretary, or some member of the Board, has felt that this reluctance to give information of various local unsanitary conditions, has prompted the assertion that there is nothing specially bad in the health conditions of the place in question, and has seriously interfered with the obtaining of full information concerning the local unsanitary influences likely to cause or promote disease. Personal interests and selfishness, more formidable even than civic selfishness, are, and always must be, with the present views of disease, serious obstacles to the thorough investigations of the causes thereof.

What is here required is the diffusion of the knowledge that in most cases, it is best, even for the individual, that the fullest possible information be given concerning all the conditions which have probably caused the disease, since it will then be possible for efficient measures to be taken for the removal of the same.

4.—*Results of the various Investigations.*—Remarks have already been made on the results of some of the enquiries and investigations carried on during the past year by the Board. It is satisfactory to know that most, if not all, the outbreaks referred to have subsided; and that their fatal results have been limited. It has been seen that in very few instances has this result been due to energetic local action, except in the case of small-pox; and that regarding the other diseases, they have in some cases apparently worn themselves out, either because the supply of persons susceptible to them had been exhausted, or it may be because the atmospheric conditions have become unfavorable to their development.

It is to be regretted that so much apathy exists in certain localities. Surely the time has come when this state of affairs is to be remedied by Local Boards being formed under compulsory statute, and when it shall be competent for the Provincial Board to see that efficient action in all necessary cases is taken by them in case they are in default or inactive.

CHAPTER III.

COLLECTION OF SANITARY INFORMATION.

1.—*Sources of Sanitary Information.*—Under the chapter with a similar heading contained in the First Annual Report, it is stated that sanitary information, such as would aid this Board in its work, and be at the same time a fund of information for all persons interested in such matters, was obtained by visits of members of the Board to foreign countries and cities in which sanitary organizations and sanitary work were in advanced stages of progress; and that by such means a large amount of important information, found in Appendix B. of the said Report, was obtained. It is also stated that there had been collected, either by purchase or by exchange, a very considerable amount of literature, relating especially to the work in which this Board is engaged. So extensive indeed, were the efforts made by the Board, especially in the first mentioned direction, that it may fairly be said that it became possessed of practically all the various methods of organization and procedure by which sanitary science is endeavouring to advance the interests of life and health throughout the world. By this statement, the Board is not to be understood as meaning that it is possessed of all the minuter details, which various health organizations in cities, towns and states have found it desirable to adopt, but that the broad underlying principles which can aid the Board in its work, have been obtained, and it trusts made use of in some degree. Thus Britain, so widely known for her efforts in public health matters, supplied a fund of information in the Reports of the Local Government Board, and in many reports of city boards, such as those of the Metropolitan Board of Works, Kensington, Nottingham, Glasgow, etc. Reports from Paris, Brussels, Geneva, Madrid and Italy are received by the Board, owing to the efforts made by Dr. C. W. Covernton, delegate to the European International Sanitary Congress last year. From the United States, the Army and Navy Reports, and those of the National Board of Health are regularly received at the office of this Board; while all the States, which have actively taken up health matters, forward regularly their Annual Reports and other publications. It has, therefore, not been necessary to visit other Boards this year; the delegation consisting of the Chairman and Secretary, commissioned to attend the Annual Meeting of the American Public Health Association at Detroit in November, whose report will be found in Appendix C., may be said to be the only commission of this nature.

The year's operations in this field have been mostly directed to obtaining more accurate and extensive information concerning the position of the various cities, towns, villages and townships of the Province, in regard to the advance made in public health matters by the municipal authorities. The way in which this work has been carried out will have been in part learned by a perusal of Chapters I. and II. of this Report. The disease reports forwarded by the Medical correspondents have been a very valuable source of information, both in themselves, and by reason of additional remarks when facts of unusual importance presented themselves, and also, by serving as a guide to the Board in directing its efforts to obtain specific information concerning the causes which had made disease prevalent in various places.

Part of such information is that detailed in Chapter II., which affords a large amount of information regarding local health conditions, in connection with disease prevalent in the Province. Mention may be made here, too, of the valuable information which the Board has been able to glean from the Reports of the Registrar-General concerning causes of mortality, and which it has been able to connect with sanitary conditions in cities, towns and districts of the country. An illustration of the use to which these statistics may be put by the Board may be seen in a paper "Why so many People die of Consumption," prepared by the Secretary, and read at the London Sanitary Convention. This is a field of sanitary work

which, begun in England, and extended by the late Dr. Farr, has proved of the greatest value to sanitarians in directing their attention to many remediable conditions productive of high rates of mortality.

Another very important source of specific information regarding the local sanitary conditions of the 640 municipalities, making up the Province of Ontario, has been obtained through a circular which was addressed to the clerk of each municipality, to the medical men who are the weekly correspondents of the Board, and to other medical men resident in places whence information was desirable, and where there were no weekly correspondents. The specific character of the twenty-one questions found in the circular, Appendix C. of this Report, made it impossible for any who received them to refuse to answer the greater portion of them on the ground of inability; and to this, and to the fact that the people generally are awakening to the importance of municipal sanitary work, it is due that reports from every county and over one-third of the municipalities have been received. The summarized information obtained in this manner, found along with the circular in Appendix C., will afford ample food for reflection to provincial and local legislators, medical men, sanitarians, and the public generally. What most people were already aware of, as regards a few municipalities with which they were acquainted, is made plain to them regarding each county and over a third of the municipalities of the Province.

Two hundred and twenty-five reports were received from the clerks and the two hundred physicians to whom the circular was sent, making the total answers received more than twenty-five per cent. of the circulars sent out.

By reference to the Appendices it will be found that the first question asked in the circular is the name of the municipality reporting. The next, whether there is any Local Board or authority engaged in health matters.

The following tabular statement gives the details of the 225 reports regarding the existence of Local Boards of Health :—

Statement of Details.	—
Local Boards in existence in the forty Counties	50
Counties with no Boards	12
Counties with one Board	15
" two Boards	6
" three Boards	3
" four Boards	1
" five Boards	2
Boards with Sanitary Inspectors or Health Officers	2 (one salaried)
Medical Health Officers	4
Medical men on Board	3
Boards with three salaried members	1

Such is all the information given on the subject. Whether there are more Sanitary Inspectors and Medical Officers of Health in connection with the Boards it is impossible, from the information, to discover. Several Boards, amongst them two city Boards, the existence of which is known, have not reported, and one of them has a salaried Medical Health Officer. One—that of Windsor—has lately been re-organized, and has also a Medical Health Officer. Information in this connection may, in some cases, have been

omitted. There are, however, hardly any answers to the question which inquires concerning the objects which have occupied the attention of local boards; and from this we are inclined to infer that had there been more sanitary inspectors, more answers to this question would have been returned. Taking the single example of a large county, such as Middlesex, it will be seen that no answer whatever is returned; and yet the Board is aware that the Health Committee of the Council of the city of London has been engaged, to some extent, in matters pertaining to the health of the city. There seem to be hardly any Boards of Health, except in cities, towns and some of the more progressive villages.

The long series of questions asked concerning the local conditions which have the most important influence on health, are given, with their respective answers in the Appendix; and the answers, with a few important exceptions, reveal a state of affairs which may well make all who are interested in preserving the health of the people think seriously of the measures which are best adapted to such a purpose.

It will be found that none but the most primitive methods are in use for the disposal of excreta, which, when decomposing, produce injurious effects now so well known, that no excuse, except carelessness and neglect, can be given for their continuance.

Again, taking the questions asking (1) for information regarding the method for the supply of water, and (2) how far apart are wells and privies—the answers show that no interest is taken in this matter, except to have both these in convenient proximity to the back door of the house, and that proximity to each other has never been supposed, by the ordinary householder, to have any influence on health.

Take again such an important question as: "What precautions are taken regarding isolation and disinfection in cases of infectious diseases?" and too frequently the answer is given: "No precautions whatever"!

Another point seems very evident from the answers to the circulars sent out, namely that the very fact of there being no Local Boards of Health in existence, has in some cases apparently prevented the clerk returning answers to the questions, either because he was afraid of publishing the fact of his municipal council being derelict in health matters; or because, there being no board of health, it was less easy to give answers to the various questions; or because he wished to preserve the credit of his municipality in matters of health by saying as little as possible; or finally, because he felt that it was not incumbent upon him to answer the questions, as he was not, in his opinion, personally interested in the matter. These are presumably the reasons why more answers have not been received, and why many of those received have proved unsatisfactory. There may have been other reasons which it would be invidious to mention; but the non-compliance with so simple a request is, to say the least, much to be regretted. One reason for this remark is, that there is no better plan for obtaining detailed information with reference to individual municipalities. It is worthy of remark that even in township municipalities there are small incorporated villages provided with no health organization and particularly exposed to the spread of infectious diseases and other unsanitary influences. From the preceding observations it will be seen that the health conditions existing throughout the Province, are very far from being wholly summed up, even in the numerous answers found in Appendix C.

2.—*The Need for such Information.*—It seems almost unnecessary after the remarks made in the preceding paragraph to say that there is great need for sanitary information. In health matters, as in many others, habit has made people generally oblivious to the fact that they are surrounded by conditions in their every-day lives, demanding amelioration; and it is only by having these pointed out, and illustrated by comparison that the conclusion impresses itself upon them that there are better ways of being and doing. This remark need not be confined in its application to the people at large, but among other means the Board hopes by the presentation of undeniable facts based on statistics to impress the people with the need there is for greater attention to the preservation of life, and increased care and regard for health, in this way increasing the sum total of national happiness and well-being. Whatever else the Annual Report for 1883 may, or may not, contain, it certainly does possess facts and arguments sufficient to show that organization and work in the direction of local sanitation are of the greatest importance and are urgently needed if what has been found defective, from a sanitary standpoint, in the

earlier history of the Province is not to continue and prove worse with the yearly increase of population.

It may be further considered whether it would not be advisable that it should be the work of some persons possessed of expert sanitary knowledge to visit the various municipalities and confer with the local health authorities regarding the sanitary conditions which exist, and the reforms, if any, which may be required. Such an official would do valuable work both in collecting and imparting sanitary information.

In school matters, every county has at least one inspector, many towns and cities have their own inspectors, and in addition there are several provincial inspectors for the higher grades of schools, all doing valuable work toward the one end. How much good even one provincial inspector in health matters might do, can be to some extent imagined, when the reports of the careful investigations of medical and other experts of the Government Boards of Health of Great Britain are perused. In the simple collection of exact information on a scientific and trustworthy basis, so much would be obtained, that existing evils would, for very shame, be removed. Are such methods to be adopted?

CHAPTER IV.

DISSEMINATION OF SANITARY INFORMATION.

The dissemination of sanitary information is one of the first and most important steps in the progress of sanitary reform in any country. If we ask ourselves, what have been the ways by which a more generally diffused knowledge of the vital processes which govern the human frame have been attained by ordinary individuals, it will be seen that it can only have been by a more general, diligent and scientific study of physical laws, and by a gradual dissemination of the knowledge thus acquired through the schools and the press. To-day there is within the reach of the poorest individuals, literature which serves as a vehicle of information in amount and quality far exceeding that which any previous age has seen. Society, furthermore, has aroused itself, and in a hundred ways is evolving schemes for organized effort for attaining ends and accomplishing objects of which former generations never dreamed. Capacity for organization, is, before almost anything else, the true gauge of social progress. This capacity is seen in various directions, in religion, in education, in commerce, in war, and lastly in matters of health.

Knowledge regarding the laws of health is increasing among people generally, and they are becoming more convinced of the fact that they have certain powers in preserving and promoting health, which need not be, and cannot be, relegated wholly to the medical profession. But, however much progress has been made in this general knowledge, it is only here and there that organization, comprehensive and effective in its nature, is seen actively and boldly devising schemes for the attainment of definite improvement in matters pertaining to public health. In Ontario public opinion has gone so far as to induce the Government to establish a Provincial Board for the purpose of better accomplishing these ends. Diffusion of more exact and extensive information of a sanitary character was the principal part of the work of this Board at the outset; and this has been, and is still being, carried on unremittingly, in the hope that organizations more executive in character, and more local in their operations, will carry out such projects as the Board, with its special facilities for observation, may urge upon them, and such as it, with its extensive field of operation, would find impossible to perform.

1.—*Character of the Information Disseminated.* *(a)* The Board has again been engaged during the past year in the work of preparing pamphlets for supplying information on a variety of special subjects. The first, and one which has been much in demand, is that "On the Disposal of Sewage." In it are set forth the principles underlying the question, and the various practical applications of such principles to the disposal of the waste products of all communities from the populous city to the isolated farm or cottage. The practical and systematic adoption of its provisions in municipalities would cause a change throughout the Province, the benefits of which are quite beyond calculation. Individual householders, as well as health officials, find in it many practical hints which they can turn to good account.

(b) Another pamphlet, which experience has proved to be very much needed, was prepared for aiding and guiding Municipal Councils in the formation of Local Boards of Health. Though Councils may, under the existing Act, delegate their powers as Health Officers to committees; and though in some cases they have done so, yet comparatively few have formed any extensive and detailed code of By-laws, by means of which such committees can take efficient action. The pamphlet referred to gives directions regarding the organization of such Health Committees or Local Boards of Health, and the appointment of Medical Health Officers and Sanitary Inspectors, and also contains forms of By-laws and regulations for the prevention of unsanitary conditions, and for aiding the Board and its Officers in performing their duties. Several copies of the pamphlet were sent to each Council, and one to every medical man in the Province whose address could be obtained. The result has justified our expectation that in many cases action in health mat-

ters had not been taken because members of Councils were in doubt as to what ought to be done and how they ought to do it. Since its distribution a number of Councils have adopted the By-laws, and more have their passage in contemplation.

(c) Another pamphlet which seemed necessary was one pointing out the action which should be taken in anticipation of the possible appearance of cholera in the Province, and the further measures to be taken by officials and private individuals if it should actually appear. It will be in the recollection of all that, owing to the fatal epidemic prevalence of the disease in Egypt and elsewhere, fears were entertained that it might travel by the high-ways of commerce, first to Britain, and thereafter to America. Had this disaster taken place past experience leaves but little doubt that Ontario would have been visited with the dread scourge. The Board therefore prepared the pamphlet to be found in Appendix D of this Report, in which there are full directions as to the action which ought to be taken by Municipal Boards of Health, by physicians and by the public generally, in anticipation and during the presence of so infectious a form of disease. A small edition was prepared, but owing to the providential circumstance that the disease has not appeared in the Province a wide circulation of it has happily, so far, not become necessary. Many copies were, however, distributed, along with other pamphlets, from the hospital-pavilion, a structure somewhat similar to the one shown in a wood-cut in the above mentioned pamphlet, which may be found in Appendix D. This hospital was constructed under the superintendence of the Board, and shown at the Industrial Exhibition at Toronto, and the Provincial Fair at Guelph. The building proved a source of interest to many thousands who attended these Exhibitions; and in it many of the most recent sanitary appliances were also to be seen. The object of the Board in erecting the structure was to draw the attention of the public generally, and of municipal officers in particular, to the fact that a hospital of the latest and most approved sanitary character could be erected in a few hours in any municipality, not only in case of Cholera occurring, but in the event of the appearance of any of those other contagious diseases much more prevalent amongst us, and causing from year to year deaths greatly in excess of those due to Cholera. It was also shown that such a hospital could be so constructed as to be easily transported from place to place, and still be made commodious and suitable in all respects; capable of being thoroughly disinfected by the application of chemicals to any of its parts; light and airy, yet sufficiently protected from inclemencies of weather; a slight adaptation of double panels making it suitable for mid-winter. We feel confident that the hospital-pavilion must have not only advanced the general work and usefulness of the Board, but must also have made very many persons conversant with the benefits that such a hospital would possess in the many outbreaks which are constantly occurring in various parts of the Province, and of which municipal and provincial, as well as personal, interests demand the suppression.

(d) Other material for the future dissemination of sanitary information is contained in the answers to the circular concerning local sanitary conditions already referred to in Chapter III., and to another addressed to Inspectors and Teachers throughout the Province, for obtaining sanitary information relating to schools, the results of which investigations will be utilized for the public benefit at some future time. Meantime, the questions themselves will arouse a good deal of attention, and will, in a suggestive way, be the means of imparting much information.

(e) A number of public lectures have been delivered at the request of Associations, Institutes, School Boards and Municipal Officers, and have been most favourably received. The Hamilton Literary Association requested the Board to give a course of lectures on various subjects connected with the public health; and lectures were in consequence given by Drs. Covernton, Oldright, Bryce, and Yeomans. A lecture on "School Hygiene," delivered by Dr. Oldright by invitation of the Ontario Teachers' Association, will also be found in Part III. Lectures were delivered by the Secretary under the auspices of Mechanics' institutes, in Elora and Woodstock; under that of a Church Young Peoples' Association, at Vanyck, in Middlesex; at Paris under that of the Union School Board, and at Galt before the Waterloo Teachers' Association. A little consideration will make it evident that this is one of the most efficient and valuable

methods of imparting sanitary information, and that it is very desirable that further and more extensive and continuous efforts in this direction should be made. In connection with such lectures there is the meeting together for that specific purpose, of the most influential and public-spirited people of every town in which they are delivered. The people have some subject of practical importance presented for their consideration, and an opportunity for the public discussion of it is given; arguments are advanced in favour of local sanitary improvements; objections are raised and answered, and resolutions passed in support of such improvements. It is, in fact, the forming of individual opinion and individual desire for action into public opinion and public action. The relations between the Provincial Board and Local Boards and organizations are made closer, and each becomes a help to the other, even as each is a part of one grand organization which must exist in order to carry on efficient sanitary work throughout the Province. Representations of the desirability of having more frequent lectures on sanitary subjects have been made to members of this Board; and this is one of the questions which it hopes shortly to take up.

(f) The London Sanitary Convention. This Convention was held in the latter part of the month of November. It was in every sense a success. What has first to be considered in connection with any such convention is its local character and aspect, and its local interest. The unfortunate inundation of London West, in July last, created conditions which made it urgently necessary that sanitary problems of more than ordinary importance should be considered. From the report of the Secretary, who visited London shortly after the time of the flood, and which may be found in Appendix F, will be gathered some idea of the various questions which demanded consideration. During this visit, the proposition was made at a public meeting, that the Provincial Board should be invited to hold its next convention in London. This proposition having been acquiesced in by the Board, it was natural that many of the subjects dealt with should have special reference to floods, and the conditions resulting from them. The papers on "The London Flood and its Results," on "The Influence of Mill-dams on Health," on "Malaria," on "Typhoid Fever," on "Sewage," on "London Water Supply," and on the "Work of Local Health Organizations," were all especially in keeping with the local conditions. If the attendance of influential citizens, medical men, and members of Local Health Committees, are to be considered any indication of the importance attached to such questions; and if discussions by citizens and others, and numerous important resolutions unanimously passed are to be accepted as an index of the interest taken in, and of the local effect of, such a convention, then it may be fairly said that the London Convention must be fruitful in good results. But the influence of this convention has not been confined to those present at it; the many valuable papers read were published more or less fully in the influential London and other journals; and the papers in full will, through the medium of this Annual Report, reach thousands of readers, many of whom doubtless will find time for their perusal and careful consideration. The holding of similar conventions at such times and places as may be found advisable, will be conceded to be of the highest importance for the diffusion of sanitary information, and the propagation of knowledge tending to the promotion of the public good.

(*g*) One of the most constant methods taken by the Board to diffuse sanitary knowledge during the past year, has been the Weekly Health Bulletin, which has been distributed in such a manner as to secure for it the greatest amount of publicity. It has been sent to the medical correspondents through whose efforts the reports upon which it is based have been obtained. The persons supplying the information are those most likely to be interested in it, and in its circulation. Another powerful medium for making it known has been the press. Every newspaper in the Province has received a copy of it, and the people may well congratulate themselves on the patriotism which the press has shown, by sowing broadcast this information on the state of public health. The interest in such matters evinced by the press, has already been alluded to in the Introductory Remarks of this Report, and the Board can find no more fitting opportunity than this for conveying its sincere thanks to the press, for so materially aiding its efforts, not only in this particular but in every other scheme the Board has undertaken.

Besides the copies sent to the medical correspondents and the press, the Bulletin

has been sent to all the hospitals and public institutions of that character, to all mechanics' institutes and public libraries, and to the libraries of all our universities and colleges. Indeed it has now taken its regular place beside the meteorological reports, and is the principal means that people have of obtaining information regarding the amount and character of disease prevalent throughout the Province.

(*h*) Special information, when occasion has seemed to indicate its necessity, has been supplied to the press concerning outbreaks of diphtheria and small-pox, and concerning many other matters which have not found, and could not find, a place in the Weekly Bulletin.

Of the first Annual Report of the Board seven thousand copies were distributed to Medical Men, Colleges, Hospitals, Libraries and other public institutions, to the Press, to Clergymen, High and Public School Inspectors and other persons. While it may be true that to some persons such reports appear only formal, and of no special interest, the Board has good reason to know that this is not the case with all the recipients of the report referred to, since the applications for it have been so numerous that the whole edition struck off is now well nigh exhausted. To the medical practitioner we trust it has conveyed information of much value on a number of special subjects, not treated of in the ordinary medical works. We are gratified to know that to many other persons also it has been of much service and interest.

CHAPTER V.

ACTION TAKEN IN, AND THE POWERS OF THE BOARD FOR, THE REMOVAL OF VARIOUS PUBLIC NUISANCES AND UNSANITARY CONDITIONS.

In this chapter a large portion of what may be called the practical application of sanitary principles by the Board will come under review. There naturally arises at once the question, What is the definition of a nuisance and what is to be included under the term ?

1. *Nature of a Nuisance.*—Nuisances may be considered to be either of a private or a public nature. There are many things which may interfere with the well-being, and business of persons living in proximity to them, but which could not be said to affect the health or interests of any large portion of the community. There are others which, coming under the latter category, may be fairly said to be public nuisances. As both classes, however, affect life and property in some degree, it is desirable that there be a common definition applicable to nuisances of every kind. Various legal definitions have been given ; some have confined the term to things which are proved to be injurious to health. Practical requirements, however, demand that such a definition be of the most comprehensive character. Hence, for sanitary purposes the following would seem to be that which adequately meets these requirements.

A nuisance is "anything which is injurious to health or which is materially offensive to the senses, or which interferes with the enjoyment of life and property." From the cases which come up in subsequent sections it will appear that, while the first part of the definition might be found very difficult to prove regarding them, yet they can be readily shown to be included under the latter part. And from the circumstances connected with the carrying on of the processes which cause some of such nuisances, it will be seen how necessary is the addition of the last portion of the definition.

2. *Methods for the Abatement of Nuisances.*—It will appear at once evident that whatever definition may be given of nuisances, there is an absolute necessity for some methods whereby they may be abated. Up to the present time it may be said that there have been two ways possible for the attainment of this end. First, there is a power which any person or persons aggrieved have of appealing to a competent court for redress. Municipal health committees may summon offenders before the courts, and have cases tried on their merits. And there is another method of procedure, which such health committees have power to carry out: on the formation of any Local Board of Health, or Committee of Health, it has been usual for the municipal council to pass health by-laws, which it becomes the duty of such boards to carry into effect. Such, then, would seem to be adequate machinery for the suppression of sanitary evils, and the abatement of nuisances.

3. *Difficulties Relating Thereto.*—Notwithstanding what has been said above, a brief consideration will serve to show that practical difficulties are met with at every turn. We shall briefly refer to some of these.

It has been already said, that a private individual, if aggrieved, has means of redress against a neighbour for creating or keeping a nuisance. But though this is true no peaceably disposed person wishes to create strife and obtain the ill-will of a neighbour. In many cases nuisances—most hurtful to life and property—are allowed to continue from no other cause. The next difficulty in such a case is that persons aggrieved and wishing to obtain redress are prevented from doing so by the expensiveness of the legal process, and by the fear that some technical objection may come up which will prevent conviction, and so throw the costs of legal proceedings on themselves. Whether such a condition of affairs is to continue will be discussed in a subsequent

section. In the matter of public nuisances some of the same difficulties are present, which have been noticed in the preceding paragraph. Supposing that a large number of persons are aggrieved, as from the existence of some manufactory, the effluvia from which affect a whole village, it is necessary for some one or two persons to take the initiative in calling together a public meeting to discuss the matter and, if necessary, take legal proceedings. Here again personal feelings are aroused against such persons, and by appeals to interest and prejudice a counter-party is organized to support the offender. Such being the ordinary course of affairs it will readily be seen that the persons composing such public meeting will be very slow to tax themselves for the legal expenses of a suit, which experience has shown may not alwayst resul favourably for the plaintiffs. For this failure of justice there are many reasons. For example, take the case of some establishment which has for a long time continued to be a nuisance, and the owner of which is threatened with legal proceedings. It may only be necessary for him to cease operations for a few days, "clean up," and when the premises are viewed, by a jury or otherwise, no nuisance having been found, there will in consequence be no conviction. The ends of justice have been defeated, and the sufferers of months, and it may be, years, both in health and property, further suffer by having to pay the costs of legal proceedings.

While the appointment of Local Boards of Health with stringent by-laws and an active Health Officer supplies adequate machinery for the abatement of nuisances, some of the difficulties will still remain. Moreover, in a large majority of our municipalities such Boards do not exist, and in others they do not act. Say they, we are elective councillors, and why should we offend influential ratepayers. It may be as much as our next election is worth. Hence they will not act. But supposing they have delegated their powers to a committee composed of citizens and members of the council, surely the difficulty is removed. By no means, for it will be difficult to find a committee who will incur personal enmity for nothing.

But supposing such a committee wishes to act, they may not be able for two reasons: the first being, that if the removal of a nuisance from any premises be resolved upon by the Board, it is powerless to effect this without money, and some councillor with other ends to serve is found who will object to a money grant to an irresponsible Board; and a second reason is one which has actually occurred, that when such committee has decided to carry out some by-law, interested or indifferent councillors have had the by-law modified or rescinded.

Another difficulty in regard to this question lies in the position of the Provincial Board as regards nuisances. This Board has been called upon again and again ever since its formation to step in and abate, or cause to be abated, nuisances regarding which some local authority has been wholly unconcerned and indifferent. In many cases the nuisances, as will be seen hereafter, have been of a most serious character. All the Provincial Board can do is either to notify the local authorities or municipal council of said complaints, inform them of their powers and call for action; or, if the Board deems it advisable, it may make an official enquiry, and advise local authorities, and still the nuisance may remain unabated. A Provincial Board so constituted has no powers, either to cause the removal of the nuisance or to make the local authorities take action. Under the circumstances, there is little wonder that aggrieved parties should demand, with much reason, for what such a Board exists, they looking mainly at the question from their own standpoint of what is needed.

From the remarks made in the preceding paragraphs, it is plain that something more is necessary for the general and effectual abatement of nuisances and the removal of unsanitary conditions. Though the evils and imperfections of existing methods and the absence of methods can be easily seen and criticized, yet it is not so easy to devise and carry out any scheme which will not conflict, to a certain extent, with existing institutions.

It is not necessary here to argue that there are nuisances and unsanitary conditions of so serious a character as to require abatement and permanent removal. Furthermore, whilst it must be insisted upon that the interests of the many, the greatest good to the greatest number, must be considered as paramount, and that no individual has the right

to endanger the safety, or interfere with the comfort, of others for his own pecuniary ends, still, in most instances, improvements may be introduced and precautions attended to, which will remove the source of such danger and interference, without causing any material loss to the person or persons whose pecuniary interests are in question.

We assume that it is the municipal health authorities which should in all but the most exceptional cases require and enforce the adoption of such improvements; and hence we must seek some means by which they can be set actually to work. It is evident that before this can take place, a strong local Board of Health must be organized.

As stated in the introductory portion of this Report, the Provincial Board is now urging upon the Legislature the enactment of such legislation as will secure the formation of a Local Board of Health in every Municipality or group of Municipalities. In this way, it is hoped that in every Municipality there will be a Board, composed partly of men elected because of their interest in sanitary matters, and their desire to improve the health of the community, and who shall give their special attention to work, having that object in view. It is proposed that the elective members of these Boards shall hold office for three years, and retire in rotation, and that the Boards shall have the power of passing by-laws regarding sanitary matters.

Such Boards being actually organized would have, (as Local Boards have now when by-laws have been passed), power to order the removal of nuisances, enter upon premises, or authorize officers to enter upon them and abate such nuisance, and assess the costs therefor on the persons causing them, or on the rate-payers.

It is also necessary, in order to strengthen the hands of such Boards, to draw more closely, to increase the intimacy of, the relations between them and the Provincial Board.

In case the latter Board agrees with them, it is quite evident that no reference to a court of law can be necessary in order to prove that a nuisance exists, or to devise the measures to be adopted for its abatement. Should any person protest against the action of the health authorities, it might then be fairly competent for him to appeal to the courts for protection; but this is throwing the costs of a suit on the right party; and experience in American cities has shown that very few of such cases occur after the authority of health boards has been once upheld by the court.

Again there are cases where municipal Local Boards or Councils, may neglect to perform their duty in the matter of nuisances, etc., and where investigation by the Provincial Board may show the removal of these to be urgent and necessary in the interests of the public health. Many instances of the kind have already occurred; but it must be remembered that effective local organization in such matters has not existed to any great extent. The question then arises, is there going to be any power by which such nuisances can be removed, and if so, is that final authority going to rest with the central Board? If this is the most effectual way of preserving the health and lives of the people, then who shall deny that such powers should be conferred? In the State of New York the State Board of Health holds the position of a high court in such matters, and the reports of that Board, in regard to nuisances, are final on endorsation by the Governor of the State.

4. *Some Nuisances Investigated.*—Under a heading including so many matters, it is necessary to do little more than refer to the various classes of nuisances, selecting illustrative cases of each.

Taking first some of the most common and easily remedied nuisances, viz., those resulting from the disposal of excreta, one or two illustrative cases will be given. One person writes:—"I know of one party who throws his house refuse at the back door into a box, and which has not been emptied for years. On this same place there is an old well twelve feet deep, filled with closet manure and the water putrefying, a piggery partly filled, two closets, a stable 40x80 feet, all being on a lot less than a quarter of an acre in extent. I could give you more instances, if necessary, to show the utter failure of municipal inspection. It has become the fashion to drain cellars and run sewage into the public drains on the street, alongside of foot-paths. Too often on municipal Health

Committees there are such men as tanners, etc., too much interested to do their duty." Comment is unnecessary.

The writer further adds:—" Until the Government appoints an inspector and imposes heavy penalties for non-compliance with laws against nuisances, etc., the whole thing is imperfect."

It is hardly necessary to state that the Secretary had to inform the gentleman, who, having been Mayor of his town, spoke with experience of municipal work, that there was no such government inspector to step in and aid him.

Another illustration may be taken from the letter of a physician, who wrote enquiring if a privy discharging its contents into a running stream constituted a nuisance. The Secretary of this Board, who, at a later season of the year, had occasion to visit the village, and inspected its surroundings, found that several houses were situated very near a creek, while, lower down, the stream passed near other houses. It is hardly necessary to remark that the pollution of a small stream, a hundred yards or so above the point where it ran close to the other residences ought to be considered a nuisance of the most pronounced character. It may be stated that in 1882 a local board had been appointed by the council of the township in which this village was situated; but in 1883 it had collapsed. The Secretary, who happened to be in the vicinity on other business, had been requested to visit the village to examine into an unsanitary condition created by a large heap of saw-dust, at a mill some fifty yards or less from the residences of several villagers. Depressions around the heap were filled with water black with vegetable organic matter. Other unsanitary conditions, such as a filthy open drain through the main street were seen and enquiries concerning them made.

The Reeve of the township was introduced by a local physician who had been a member of the defunct board. The Secretary directed the attention of the Reeve to the existence of these conditions in his municipality, and showed him how important it was that the council should move actively in the matter. The Reeve was, however, of the opinion that the council would be very averse to taking action in any matter involving the expenditure of any money in the village, or of doing anything which might offend any of the rate-payers, especially the owners of the saw mill. Nothing more has yet been done so far as we are aware, and so the clergyman and his family, living near the saw-mill, must continue to be injuriously affected by the unwholesome surroundings.

This brings us to the consideration of another class of nuisances commonly complained of: the influence of small areas of stagnant water in producing miasm, with its baneful effects, is very generally known and appreciated, and yet the drainage or filling in of these areas is seldom undertaken by the authorities. Other difficulties than the simple inactivity of local authorities sometimes creep in, as appears from the following letter:

"Dear Sir,—In the rear of my house is a large pond of stagnant water. It is a most malaria-breeding institution and those living near it are earnestly desirous to be rid of it. The property is held by agents of the ——— family and cannot be sold until the youngest comes of age. Meanwhile the nuisance exists. What can we do? Is there any law compelling the parties to remove the nuisance? It can be easily drained. If you can afford us any help in the matter we shall be obliged.

"Yours, very truly,

"—————,

"*Methodist Minister.*"

Here again a defaulting municipal council has apparently disregarded the expressed opinions of a number of persons anxious to remedy an evil for which no one would seem personally responsible.

Of a similar nature is a nuisance complained of at Cannington, where a large amount of stagnant water near a school, and impure drinking water, had created an epidemic of Diarrhœa amongst the children; and yet from the correspondence it would seem that neither to the municipal council nor to the school trustees did the matter seem of sufficient moment to warrant the small expenditure necessary to procure an analysis of the well-water, which one member of the school board had urged.

In various parts of the Province there are large accumulations of saw-dust, which, gradually decomposing, are productive of malaria and other unhealthy conditions. A case of this kind existing at Coboconk was described in last year's report; one has already been referred to in this section; and another which is interesting on account of its extent, is reported from Parry Sound, where enormous deposits of saw-dust have been made in the low ground along the banks of the river, upon which deposits a number of workmen's houses have been built, with cellars excavated in the saw-dust, which, by settling, has become firm enough to answer for a foundation. This Board was requested to take action in the matter, inasmuch as in a short time the decomposition going on in the material upon which the houses are built cannot fail to produce the usual effects of air tainted with emanations from decomposing organic matter, fruitful in aiding the development of zymotic diseases, and keeping the systems of those subjected to them in an almost constantly depressed condition. The matter was referred to the municipal council, but, as remarked by our correspondent, it is useless to appeal to any local authority, inasmuch as the influence of the lumber company which creates the nuisance is so great in the village that no council could afford to take the matter up and create a disturbance with that company.

Now that chemical processes have become so advanced, as they are practically shown to be at Deseronto, where saw-dust is utilized in making illuminating gas and other chemicals, it seems only just that such companies, especially as they have no lack of capital, should, by law, be required either to burn, or utilize for chemical purposes, the saw-dust which is produced at their mills. In this connection it is a pleasure to be able to state that some of the mills at Parry Sound, as also at Midland and elsewhere, have large furnaces for burning the saw-dust. There is no reason why other mill owners should not follow these examples, or else endeavour to make some profitable use of this material. Such regulations are necessary in the interests both of the river and lake fisheries, and in the still higher interests of life and health.

Another class includes effluvium nuisances, which, on account of their diffusive character, are brought prominently to the notice of the public. They are of various kinds, but almost all have one feature in common, and that is that they are found in places, in most instances manufactories, where there are large accumulations of organic matter, principally of animal origin, and that the nuisance arises from the decomposition of these materials. Some of the cases which have come under the notice of the Board are ncluded under the following heads :—

1. Pig-pens.
2. Cow-byres.
3. Pork-packing establishments.
4. Slaughter-houses.
5. Cheese-factories.
6. Soap-factories.
7. Glue and blacking factories.
8. Fat rendering establishments.
9. Knackeries or Bone factories.
10. Artificial manure factories, and sewage outfalls and deposits.

A few words may be said under each of the above heads. Speaking of them collectively they may be said to arise from the decomposition of organic matter, but especially of animal organic matter. There are qualifying conditions such as the amount of such material, the amount of nitrogenous matter present, the stage of decomposition at which the various materials have arrived when used in the manufactory and the method of the treatment immediately thereafter.

From the sanitarian the following questions demand consideration :—First, are the above mentioned establishments necessary? second, if they are necessary, can they be so conducted as not to create a nuisance? third, what are the conditions to be observed, if any, by which they shall be prevented from becoming nuisances? and fourth, in what situations should they be carried on?

By a perusal of the ten classes already mentioned it will be seen that all may fairly be considered necessary, since they utilize for the production of useful and needed articles

of commerce, materials which must be disposed of in some way or other. Assuming, then, their existence to be necessary, the next point to be considered is whether their existence in populous places or near human habitation is also a necessity. Here there certainly is ground for argument. To say that certain establishments are in existence in populous centres and that hence there would be injustice caused by their enforced removal, is aside altogether from the question. For if any person is doing an injury in any way to his neighbour, the law can surely take cognizance thereof, and for sanitary or other considerations order the removal of the cause of injury. The only points to be considered in this connection are, how far from human habitation such establishments can be profitably carried on; and how, and to what extent, through the adoption of precautions, they may be carried on so as not to be a nuisance to those living near them.

Regarding the first point, it is evident that such establishments would be less liable to be nuisances in country places than in towns; but we must consider how near they must be to the sources of the raw materials in order to enable them to pay commercially, or in other words, to make their existence a possibility. If they are to remain in centres of population, then very definite ideas and detailed measures must be adopted if they are not to become nuisances. Some of these questions have been taken up by one or two municipalities in Ontario; but, practically, every person has *carte blanche* to do as he pleases in such matters, remembering always that legal process may convict him of keeping a nuisance. The difficulties in doing sanitary work in this manner, already discussed in this chapter, make it quite plain that something else than this is urgently needed.

Toronto and one or two other cities have by-laws making it illegal to keep pigs within the city limits, and cows within a certain distance of human dwellings. Cow-byres and dairies are in one or two instances to be removed beyond the city limits. But taking Toronto as the city of the Province which ought to be furthest advanced in sanitary matters, it is perfectly well-known that such by-laws have not hitherto been thoroughly carried out.

In the matter of manufactories of various kinds certain regulations must finally be adopted here as elsewhere: licenses to begin them should in every case be taken out; and they should be established only on certain conditions, and the non-compliance with these conditions, either in the building or working of the establishment, should make the proprietors liable at any time to a fine, and if necessary to the stopping of the industry. By such methods the burden of proof that a nuisance is not created, will be thrown on the offender against municipal law, and it would soon be found that the by-laws must be conformed to. Without going into the details of the prevention of the different classes of effluvium nuisances, it may be worth while to consider a few general principles which are universally applicable to them.

1. The first of these is the using of all materials when fresh, *i. e.*, before putrefaction has commenced, and the removal of all waste material in a similar condition of freshness.

In the case of piggeries and cow-byres, this means that nothing shall be stored or used on the premises, either for feeding or otherwise, which shall give rise to offensive effluvia. It means not only the thorough and complete removal of the manure daily, the avoidance of soil pollution, the washing down of all polluted places, the carting away every day of the solid material to a sufficient distance beyond the town or city limits, to be used for agricultural purposes, and the immediate precipitation of organic matter in the liquid portion, or else its removal also, before decomposition can take place. It also means that there shall not be employed for feeding, or other purposes, any material which is liable to leave behind it any sourness or putridity, such as large quantities of materials which are subject to acid fermentation, which fermentation will take place even in the small quantities absorbed and held by the vessels in which the material has been contained, and which, in large establishments, may be carried a very long distance by light winds, and cause a very offensive odour. All this is essential for the prevention of nuisances.

2. The next point which needs careful attention is the management of the vapors

which arise from these various trades. In most cases steam is now allowed to escape into the air in the most careless fashion, without any attempt at all either to condense it, or limit its being widely diffused in the air of the neighbouring streets, roads, or dwellings. In some the attempt is made to deliver it high into the air. This, in many cases, fails to do more than relieve the premises themselves, while it aids the lateral spread of the malodorous gases of decomposition far and wide, since, as such vapours cool they will gradually descend toward the ground, where they will create a nuisance. Of course, prevailing winds spread these offensive effluvia, and determine the localities to which they become nuisances. Experience and theory go to prove that this is not the only, or even the most economical, method of treating the steam from these establishments. In one instance referred to in this report, where the Secretary of the Board had been called upon to inspect such an establishment, and where he had suggested remedies for the evils in existence, the manufacturers have introduced certain improvements. The vats have funnel-shaped covers, from which pipes lead to one common pipe dipping into a condenser of water. These manufacturers have informed the Secretary that the vats boil some three or four hours sooner than when no covers were used, a considerable saving in fuel has resulted, and, moreover, the condensation and recovery of valuable fats from the steam carried into the pipes will gradually recoup them for the expense involved in the improvements.

3. Another point of great importance, in establish ments such as those to which special reference has been made, is the management of the refuse after the commercial products, as the neats-foot oil, lard, tallow, sausage-skins, glue-stock, and bones have been removed. It will be understood that this refuse consists of the residue from the boilings, including the fleshy fluid extracts, and the solid, muscular and other tissues, as well as parts of the intestines and manure which they contain. They are just the portions, consisting of nitrogenous constituents, which after boiling and being thrown in heaps when warm, are in a peculiarly fit state for undergoing rapid decomposition. There is a very considerable difficulty in disposing of these materials; hitherto in Ontario they have been either irregularly carted away as manure, the liquid portion being allowed to run away and spread out on the ground, leaving, by evaporation, a putrefying layer of flesh of a horrible character; or they have in other cases been run into vats on waggons, to be carted away, at least once a day, spread on the land, and ploughed under. These are the materials from which the greatest nuisance arises; it is necessary that most definite arrangements be made for their manipulation. Experience has shown that their daily removal in waggons is a crude and filthy, as well as a most irregular, process. A farmer agrees to take them away for the sake of the manure, but his other work will interfere, and they accumulate and decompose, or, if he carts them away, it is done in a loose waggon, which spills the liquid along the highway. Then there is irregularity in ploughing them under, or a small patch of ground is kept for ploughing them in, the soil of which becomes saturated and malodourous.

Another, and a thoroughly good plan if carried out in its entirety, is to express the liquid from the more solid parts and dry the latter rapidly; thus it is not only prevented from decomposing, but an article of commerce, dogs' meat, is prepared. There remains, however, even in this process, the expressed liquid portion to be disposed of; how this is to be done has long remained a vexed question, and it is one which, as yet, has not been satisfactorily settled. But the most recent, and apparently the most satisfactory, way of dealing with this liquid, would seem to be by precipitating all the suspended or dissolved matters by means of some mechanical or chemical action If chemical combination takes place, this precipitate will undergo decomposition much less readily than the material otherwise would. The clear liquid, from which the matters in suspension have been precipitated, can, after twenty-four hours, be run off without, in any great degree, polluting the neighbouring soil or water-courses. The material left, is removed from the vats after settlement has taken place and is used as a fertilizer. If in England sewage can be so worked that its liquid portion can be emptied into rivers in so pure a state as to cause no pollution, it will be a very easy matter for capitalists to manage liquid sewage from their manufactories so as not to cause a nuisance. Mechanical and chemical appliances in abundance are in use in England and elsewhere, and hence it only requires

firm and decisive action on the part of Local Health authorities in order that such manufactories may be kept in conditions not seriously impairing health, nor reducing to any great extent the value of surrounding property.

Some of the nuisances referred to in these last remarks have been taken up in our law courts, viz., the Hallet and Harris cases, which came up for hearing at the September Sessions of the County of York. The Hallet case is that of a manufactory situated in the village of Doncaster, across the river Don, and just outside the limits of Toronto. In it there are worked all the parts of animals which yield tallow, parts which yield gluestock and neat's-foot oil, as hoofs, horns, bones, etc., and, in addition, pieces of hide with wool, hair, etc., which are dried.

Hence it is apparent that there is ample opportunity for working up whole carcases, and thus it has happened that in addition to the refuse from slaughter-houses which is usually taken there fresh, there have also been the carcases of animals that have died from disease. It is evident that the greatest care must be exercised if these materials are not to create a nuisance. Such precautions were not taken; and the remonstrances of villagers and of the Local Health Inspectors having proved vain, the latter summoned the proprietors before the magistrate, who, after examining the witnesses, sent the case to a higher court for trial. The Secretary of the Board having been summoned gave evidence, and after further evidence on both sides of the case had been taken, this Court gave a verdict for the prosecution; but sentence was deferred in order to give time to have the nuisance abated before the holding of the next Court. An inspection of the premises in December by the Secretary showed that such permanent improvements had been made in the treatment of the vapours that a certificate could be given in regard thereto; but the arrangements for the regular working of the refuse boilings were not perfected, and hence the nuisance cannot be said to have been removed.

The other case, known as the Harris Case, is that of a similar establishment in Leslieville, where large numbers of pigs are fed from the boilings, which include slaughter-house refuse and the refuse from several large hotels. The proprietors have stated that hardly any carcases of animals that have died of disease are utilized at their works. Although the latter, when inspected by the Secretary of the Board at the request of the County Attorney, were found to be in a more satisfactory condition than the Hallet factory, yet they cannot be said to be in a permanently satisfactory condition; but inasmuch as the case is still before the courts, an inspection of the premises by the jury having been permitted, and the jury having disagreed, it is not proper for this Board to express any opinion on the matter at present.

Besides these two cases of this class, another of much less magnitude, and yet one which has caused much personal feeling and trouble, is that of a knackery in Richmond Hill, a report of which will be found in Appendix E. Briefly stated the case was as follows: From information sent to the Secretary of the Board it was evident that a nuisance existed, and medical testimony asserted that it was producing, and had produced, serious effects upon health: if not actually creating disease, it was at least making it assume a more serious character. The Secretary wrote to the Clerk and pointed out the duty of the village council in the matter of nuisances. It appeared in the sequel that this council did not take action, probably for some such reasons as those mentioned at the commencement of this chapter. The suggestion made by the Secretary that, if the council poved lax in its duty, redress might be had through the courts, was not acted upon, and some of the most active persons aggrieved, expressed very strong opinions regarding the efficiency of health organizations, both local and provincial. It being deemed advisable that this Board should take action, the Chairman visited the village and examined into the whole matter. It appears that the council was inactive, not only because some of its members deemed the nuisance of little importance, but also because a slaughter-house complained of at the same time belonged to a member of the council. A meeting of this last named body was held at which a large number were present to give evidence and express their opinions. After this the Chairman pointed out how necessary it was that action on the part of the Health Committee of the Council should be taken in these and other matters, if the various unsanitary conditions complained of were to be removed. The opinion and attitude of the council appeared to be in favour of increased attention to

sanitary matters, but the same result has to be reported, as in the case of so many other places. This Board from later information understands that no permanently remedial action has been taken for reasons similar to those already mentioned, and unless public opinion expresses itself in a forcible way at the municipal elections the evils existing must, we suppose, continue and increase.

We may now refer to the smoke-nuisance which was alluded to by a prominent English scientist, who recently visited Canada, as being very conspicuous in Toronto. From a lengthy report on the subject prepared by Dr. Cassidy, and found in Appendix E. of this Report, it is apparent that the injurious effects of smoke upon vegetation, upon the enjoyment of life and property, and very probably upon health, are present in Ontario to a very unnecessary extent. The whole question is there discussed and remedies for it suggested. It will be remembered by some that a recent decision in the courts has shown that such cases of smoke-nuisance come within the meaning of the term nuisance under Canadian law; but the reference of the case to a superior court shows that great and needless expense in the abatement of such nuisances is incurred, and hence the means for removal of nuisances already so frequently referred to are again shown to be urgently called for.

5. *Results obtained by the Board in connection with Nuisances.*—If these be measured only by the practical results actually achieved in the removal of unsanitary conditions during the past year, there is little reason for congratulation. But a large amount of information in regard to the details of many offensive trades and unsanitary conditions and the methods by which they may be remedied has been secured and formulated—ready for use in the future. Evidence and arguments have also been obtained of and for the necessity for further legislative enactments with a view of dealing properly with these matters.

This information is very important, since it furnishes the Board and the Government with data upon which to discuss, in a broad and comprehensive way, the measures best adapted for thorough and permanent removal of nuisances. But while in this sense the results are most valuable, yet it is equally plain that if such measures are not adopted the tendency will be to perpetuate present evils and to encourage the extension and creation of others. In such matters inaction means the extension of the evil; and the disastrous effects of such a policy on the general usefulness of the Board will be very great indeed, since it is in the removal of offensive and unhealthy conditions that the ordinary public can best see what is being done in regard to health reform, and hence they will be most ready to applaud where evils are removed, and to condemn where their continuance is allowed.

There is certainly in this field room for the united labours of this Board in conjunction with those of Local Boards in every municipality. The total effects of such evils upon health are more than from any other source, as it has been shown than upon them depend in very large degree the outbreak, propagation, and virulence of zymotic and many other diseases which figure so largely in the death and sickness rates. Surely there is need of reform and organization in this respect.

In conclusion it may be remarked that whilst this Board recognizes the fact that the greatest good of the greatest number must be made paramount, still it cannot but be a source of congratulation that in many cases the adoption of proper measures has proved a boon and a source of profit to proprietors of what have before been nuisances, and from this circumstance the Board would hope that very little opposition will be met with from any class of persons in the introduction of improved principles and in the doing away with unsanitary conditions.

CHAPTER VI.

SCHOOL HYGIENE.

What it should embrace.—It has been remarked by Dr. Cameron, of Dublin, that "no inconsiderable portion of the life of the inhabitants of civilized countries is spent in schools and colleges, and that the hygienic condition of these places and the physical condition of the bodies of those who spend their time in them, are matters of great importance to the community."

It is of the utmost importance that clear ideas be obtained of the various influences which affect favourably or unfavourably this physical condition, and that the various elements which enter into the problem of School Hygiene, be thoroughly understood and acted upon. When it is remembered that education means the development of all the faculties, and that the conditions of success depend largely upon the healthy growth of the body, it is evident that we must consider what influences promote or retard this healthy growth. The undeveloped bodies of young persons are plastic and especially susceptible to the influences of conditions such as the purity or impurity of air, its temperature and the amount of moisture it contains, the character of the soil, the nature and quality of food and water, the amount and direction of light, the cleanliness of rooms, and of the bodies of the young persons themselves, the condition of the offices and grounds to which they resort, all of which are matters of great importance in their effect on the physical system.

When it is further remembered that the scholar is forced to sit during a large proportion of the time he is in school, and that the body has positions proper for it, it is evident that wherever these positions are not maintained, results prejudicial to health must follow. The kinds and amount of exercise engaged in have similarly important effects. All these points must be considered in their influence upon the health both of body and mind, for the conditions referred to exert a certain influence on the mind as well as on the body; but there are others which, in their direct effects on the former, are of such importance that their special consideration is necessary in the discussion of the wide subject of School Hygiene.

Some of these are the questions of (1) the age at which it is desirable that pupils should enter school; (2) the number of hours that pupils of different ages should be confined in the school-room; (3) the nature of the studies best adapted to the mental powers of pupils of different ages; (4) the methods of instruction best adapted to develope the mind generally and those specially suited to pupils of different ages, sexes, peculiarities and temperaments; (5) the amount and number of studies, and the time which ought to be given to their preparation; and finally what methods, studies, exercises and recreations are likely to afford that vigour so necessary for the equipment of those whose future work must be carried on in so many varied fields and diverse occupations.

In enumerating the various conditions of school life which have a bearing upon health, we have only as yet referred to the health of the pupils. But it is self-evident that many of them have an important influence on the teacher also, and whilst his system is less susceptible than that of the young persons intrusted to his care, it must not be forgotten that he is in many cases to spend the rest of his days amid the conditions referred to. And not only will these conditions affect him personally, but they will also affect his work and act indirectly on his scholars; since upon his mental condition will depend the vigorous and proper performance of his duties in the instruction and management of his pupils.

The methods of instruction adopted by the teacher are important elements in the education and development of the pupils. The teacher who intelligently pursues methods of instruction in accordance with the principles of physiological and psychological development will not interfere with such development, and will at the same time

achieve much better results, and arouse a greater interest in his meritorious task, and will himself catch the inspiration of enthusiasm in a far greater degree than one who adopts routine methods of teaching.

It would not be advisable at this time to make any very detailed statements regarding the present sanitary condition of schools in this Province. The replies given to the circulars issued by the Provincial Board will in due time afford more definite information on this point. There is in the meantime no doubt that a great many reforms are required. We have good reason to believe that many of our school-rooms are in a very unsanitary condition; that neglect of precautions to prevent the spread of contagious and infectious diseases, overcrowding, and many other causes of diseases commonly exist.

The public are, however, becoming more and more interested in the subject of school hygiene, and in many places active measures have been adopted by school authorities to prevent the spread of contagious diseases in schools. The site, structure and surroundings of school houses have also been considered by teachers and trustees as matters of the utmost importance. The report of the Minister of Education for the year 1880-1 contains at page 247, a reference to the favourable improvement in public sentiment in the following words :—

"It is satisfactory to see that the general public is beginning to understand that the prevention of disease can be made more certain than the curing of the disease itself, and while the State and society are both specially charged with discharging their full duty in this respect, inasmuch as it would preserve to the nation that large proportion of its population which is prematurely cut off, and induce a higher average term of life, there cannot be too much attention in the school itself to giving familiar information to each child, of rules of health, and in protecting him against bad ventilation, lighting, heating and other defects of the school-house."

In our Province elementary education has become compulsory and universal, and is regulated by the state, and higher education has also become very general and intensely competitive. Consequently, it is all the more important that the state should exercise a careful supervision over the system of education and the methods of instruction pursued in all our schools.

It is quite proper for us in this connection to enquire whether the subject of school hygiene has been accorded that prominence in the programme of studies in schools which its importance demands. Since 1877 the programme prescribed by the Education Department has been made more flexible, and several compulsory subjects have been made optional. School hygiene, especially since the establishment of the county model school system, has been made to occupy a more prominent position among the subjects of instruction for public school teachers. As a result of this the number of pupils studying hygiene in our public schools has more than doubled since that year.

In our high schools, during the same time, there has been a very rapid decrease in the number of pupils receiving instruction in this subject. This decrease may be accounted for by the fact that high school teachers are not required to place hygiene on their programme of studies.

The advisability of making it a compulsory subject of examination for teachers in order to secure their attention to it is recognized by school authorities in other countries. For instance, in the special report on Normal Schools in the United States, given by Dr. McLellan, Inspector of High Schools, this subject is alluded to. He reports upon the City Normal School of Boston, that "(1) Physiology and hygiene, and (2) Psychology are two of the five groups of studies in the professional work of the school." He says that "the limits of the powers of children, the physical condition of effective mental action, and the conditions of growth and health, the necessity for rest, air, sleep, and the means of securing these, the means of guarding children against draughts of cold air, against excessive heat, etc., all these and many other details are considered and discussed for a special purpose, giving the student a special knowledge acquired for application to a particular calling. It is justly assumed that physical education is of paramount importance—that the *corpus sanum* is a necessary condition of the *mens sana*."

What can be done.—It is expected that in the training of teachers in our Normal and Model Schools physiology and hygiene will occupy a prominent place. In this way the

influence of teachers will be exercised not only in the schools, but also upon the public mind generally in the way of promoting sanitary knowledge, and of impressing all with the great necessity there is for carrying out the principles and rules of health.

There is another way in which much good may be accomplished, viz., by enforcing, through authority, the laws of health in our schools. The Education Department has given efficient instructions and prescribed regulations regarding sites and structure of school houses, ventilation of schools, desks and seats for pupils of different ages, precautions to be observed in order to prevent the spread of contagious diseases, and the number of hours to be devoted to studies. But these instructions have not been so carefully observed by school authorities as they should be.

The reason for this neglect is that, with certain honourable exceptions, no persons have considered it to be their special duty to see that all these hygienic requirements are enforced.

Local Boards of Health have never taken any interest in promoting or cultivating the health of inmates of schools and colleges. In order to remedy this neglect on their part the appointment of a medical health officer in connection with every local board of health should be made compulsory. Among his other duties he should be required to inspect the schools in his district regularly and give directions regarding the best means of carrying out sanitary measures. He should be consulted regarding the site, structure and surroundings of school buildings proposed to be erected or in the process of erection. He should also co-operate with the teacher in regulating the methods of instruction, physical exercise, and seating of pupils, and in procuring desks and seats best adapted to pupils of different ages; he should see that school rooms are properly lighted, ventilated and warmed. He should, in short, attend to the sanitary requirements and conditions of school rooms and to the health of pupils generally. In the performance of these and similar duties he would in no way interfere with the authority or duties of trustees or teachers, but would on the other hand render them very valuable assistance in carrying out those sanitary reforms that are at present so essential to the health, happiness, and future welfare of the inhabitants of our Province. Frequently trustees have found it necessary to invite the professional assistance of resident medical men in cases where epidemic, contagious and infectious diseases threatened the health and lives of pupils, and in doing this they have earned the gratitude of parents, guardians and all sincere friends of education, by preventing the spread of these diseases. Therefore, in further extending the powers of local boards of health by enabling them legally to employ competent health officers for schools, it is hoped that very beneficial results will be obtained in many other ways besides preventing the spread of contagious diseases, and that the approval of the public will be secured in the accomplishment of this reform.

In Appendix F, Part II, of this Report, may be seen the reports of the Committee on School Hygiene, and in Part III. addresses by Dr. C. T. Campbell and J. W. Dearness, Esq., of London, and by Dr. Oldright, bearing directly on schools and school hygiene, and one by Dr. O. W. Wight, of Detroit, one portion of which has reference to certain matters appertaining to this subject.

In these reports and papers the various points connected with school hygiene are so fully taken up that they need not be discussed in this chapter of the Report proper.

Amongst such points are: the impurities found in the air of schools, and the results of these; cubic air space and various reasons and methods for securing good ventilation; the heating or cooling of rooms, and the practical use of the thermometer; sites for school houses; the condition of the soil; drinking-water; clothing; cleanliness of rooms and pupils; school yards and the proper conditions of necessary conveniences; condition of the play-ground; character of games; physical and mental exercise and rest; school-life, school hours, recesses; kindergartens; hours for home work, and proper amount of it; defects in sight and hearing; amount and direction of light; fire drills and means for the speedy evacuation of the school in case of necessity; desks and seats; means for checking the spread of infectious diseases; the teaching of hygiene in our schools.

Voice culture is being more largely attended to in schools, and great benefit is derived from it, both indirectly and directly, as in the development of the muscles of the throat, larynx and chest.

Hereditary and constitutional defects in children should be considered and studied by the teacher.

The teacher should not be forgetful of the imitative nature of children, and should in all his habits and manners be a model to them—in temperance, exemplary life, good habits, cleanliness, neatness. He should endeavour to win their confidence, love and respect, and make them feel that he has interests in common with them. And as regards this special subject we may add that the school-room should be a mode of sanitary perfection, and the teacher a sanitarian.

It is to be hoped that the key note which has been struck by the present Minister of Education in regard to school hygiene will resound and be re-echoed throughout the whole school system of the Province.

CHAPTER VII.

LOCAL HEALTH ORGANIZATIONS, THEIR POWERS AND DUTIES.

No lengthened dissertation is here either desirable or necessary on the problem of how public work is to be performed, whether it ought to be mostly done by municipal government or by a more central system. It is quite sufficient to remember that that system is, on the whole, best which results in causing the individual citizen to most perfectly perform the work which is peculiarly his duty ; since whatever system best serves to make each person dependent on himself for the supplying of his wants, and the protecting of himself from the many external influences militating against him, morally, intellectually and physically, so far as such supply and protection can be efficiently secured by individual effort, that is the system which gives to a nation an amount of solid and reserve strength which no autocratic or bureaucratic system, however complete, can supply.

But whilst it is true that the strength of a nation for good lies in a large number of efficient units, rather than in a unit with ever so many ciphers, it need hardly be asserted that this national strength is dependent very largely on the combination of these units for such purposes as are clearly beyond the scope of individual action. The organization of individuals, with more or less distinctly expressed ideas in common, becomes a source of strength for the accomplishment of any great work. In Ontario individual effort laid the foundations for the development of a great country. But it will be remembered that organization for certain purposes took place early in the little settlements which dotted the country. Schools, churches, roads and bridges were built, and so well has the work been done that it challenges the admiration of the world. But in some other directions there has hitherto been but little organization and almost no progress. This is notably the case in matters pertaining to the public health. But referring especially to the subject of this chapter we will first speak of

1. *The present condition of Local Health Organizations and the results.*—In this, as in other countries, legislative enactments have been made from time to time with the object of promoting the public health : in the Municipal Institutions Act of Ontario we find important measures for preventing nuisances and the selling of tainted food, for regulating public water-supplies, drainage and disposal of sewage, and for many other matters of prime importance. Besides this, the Act of 1873 respecting the Public Health (chapter 190, Revised Statutes of Ontario), contains other enactments for sanitary purposes, and establishes the authority by which they are to be executed. Section 2 of that Act reads as follows : "The members of the Municipal Council of any township, city, town, and incorporated village, and the trustees of a police village shall be Health Officers within their respective municipalities, under the next four Sections of this Act ; but any such Council may, by By-law, delegate the power of its members as Health Officers to a committee of their own number, or to such persons, including or not including one or more of themselves, as the Council thinks best."

It will be apparent from a study of the above mentioned Acts that there are abundant provisions for the formation of active Local Health Committees, and that the Municipal Act enables councils to pass very stringent health by-laws ; and that it was intended that public health work of a very comprehensive character should be initiated and efficiently carried out. That it is not so carried out the contents of the previous five chapters amply prove ; and there is irrefragable evidence of neglect in this particular, in the replies to the circular issued by the Board, which may be found in Appendix C. of this Report.

It will be noticed that, by the terms of Section 2 of the Public Health Act of 1873, already quoted, every councillor is *de jure* a health officer, unless the powers of the council in such matters have been delegated to a committee composed of its own members with other persons, or to a committee of other persons wholly apart from the council. When a correspondent, in reply to the above mentioned circular, states that this or that munici-

pality has a Local Board of Health, his answer may mean that such a Board exists only in name, or that it is really active, and the interpretation to be put on this statement will depend on further explanations.

Two hundred and twenty-five correspondents have sent replies to the circular. Of this number only fifty state that there are Health Committees in their respective municipalities, and several gave the additional information that they were *not active.* It is manifest then that the powers of councils in calling such bodies into existence have hitherto been exerted in a deplorably small number of instances.

It may not be out of place here to refer to some of the reasons for this state of affairs. Let us think for a moment of the manner in which individual municipal councils have come into existence. Take as an illustration one of the newly-organized townships of Muskoka. Government grants and private enterprise have scattered settlers here and there throughout a surveyed township. These settlers need roads, bridges and schools. Originally there will probably have been a government colonization road through the township, and this probably will be all that the Government feels called upon to do in the matter of settlement. These settlers hold a public meeting, and determine to organize a municipality. They apply for their charter of incorporation, and when it is obtained they are enabled to select from amongst themselves a municipal council. Such a council will necessarily be composed of the most active and best educated settlers. They probably select a post-master or some teacher, who has taken to farming, as their clerk. The members of such a council are *de jure* health officers. They have organized, however, to build bridges and construct roads, and will borrow money for these purposes. The fact that they have duties in reference to public health has not, in one case in fifty, entered their minds; and even if it had, these robust pioneers would laugh at the idea that their legislation is needed in matters of public health; and moreover, as they have not especially studied sanitary matters, they would probably not evolve anything very satisfactory in regard to by-laws for the preservation of the public health. All these matters are relegated, and naturally so, to the pioneer doctor. But the township developes, and has developed. When roads and bridges have been built, schools and school-houses next engage their attention; and after these are established, the progressive municipality, with perhaps its share of refunded municipal debentures, enters upon its third stage—one of saving. Progress is henceforth doubtful, unless in some cases it be in the matter of drainage and thistle by-laws. Year after year of municipal government passes, and the health functions of the council remain in abeyance and are never called into existence, even though villages, often of considerable size, spring up here and there in the township. The council and its officers become wedded to their old ways. Other conditions, such as the increased cost of living or of doing a larger share of municipal work, are not considered. It follows that when the clerk of such a municipality receives a circular from the Registrar-General's Office, or from that of the Provincial Board of Health, he will answer the questions contained therein in the most perfunctory or imperfect way, because he feels that he is underpaid, overworked, or, possibly, for fear that he may be telling tales against his municipality, which, in some imaginary way, may do it harm. With slight alterations the picture painted here applies equally to towns, and even cities.

It then seems a fact beyond cavil that the present provisions for carrying out matters relating to public health have resulted in nothing more than the appointment by the council in some of the larger towns and cities, of health inspectors, to whom are deputed whatever powers for preventing nuisances and inspecting food belong to the council. The amount of remuneration given is not, in most cases, such as to impress the officer very powerfully with the idea that most important responsibilities rest upon him. In very few of our less populous places are measures taken even for that very elementry sanitary requisite, the regular and systematic removal of refuse.

2. *The Constitution of some Foreign Local Boards.*—From the fact that municipal institutions in many of the States of the Union are similar in character to those of Ontario, it becomes interesting to compare the methods for carrying out local health provisions in the two countries. It may be stated in a general way that there are few States which have more exact legislation on the subject than that which has been noticed in the pre-

ceding Section. New York State, by the general Public Health Law of 1850, had, in consequence of the severe epidemic of Cholera of the previous year, provided for the establishment of Boards of Health at the option of the councils, or Boards of Trustees, as they are called in that State. In the same State enactments of a similar character were placed in the law of 1870 for establishing incorporated villages. We are informed, however, by Dr. Elisha Harris,* Secretary of the New York State Board, that few of those councils had in 1880 availed themselves of their powers under the Act. Quoting his words, "Few, if any, of the local boards in villages or in towns evinced any activity or had any special preference for a particular method of sanitary organization. In cities and towns alike, with rare exceptions, the chief health officers held their places rather as a matter of form than of fitness..........It was early ascertained that in all parts of the State the more enlightened and public-spirited expressed a desire for decided improvement in this sanitary service of the people, in townships as well as in villages."

In consequence of this state of affairs, in 1881 an amendment was passed to the previous Health Acts, and this amendment has produced most excellent results. As stated by Dr. Harris, "Its chief advantage consists in enabling a town, village, or city to organize its board of health upon a basis of competency and power to become efficient, and yet to be required to maintain a strict accountability and economy in all its affairs. It provides that the State Board of Health shall call into organized activity any town board of health, and that such board must maintain the laws relating to the complete and perfect registration of deaths, births and marriages, and also be ever in readiness to repress and provide for contagious and infectious diseases and other causes of danger to the public health."

The same difficulty existed in New York State which now prevails in Ontario, viz.: that the supervisors and councillors had to provide for the registration of vital statistics; and hence, as Dr. Harris remarks, "It has become a delicate yet very necessary duty to modify the operation of these two statutes (those of 1847 and 1850) to such an extent as would make each local board of health responsible for the completeness and efficiency of this duty relating to the vital registry, which, as now construed in all countries, is closely allied to the necessary sources of information and duty of loeal sanitary authorities."

Regarding the organization and duties of town boards of health, Dr. Harris gives the following details :—"First. The supervisor, at the request of the State Board of Health, or on his own motion, or that of other citizens, convenes the justices of the peace and the town clerk; they at once proceed to elect a member specially to counsel and aid in their work. These together constitute the town board of health. They must elect a competent physician to be health officer.

"Second. The regulations and orders which the Board would promulgate, are duly adopted and published, or publicly posted.

"Third. The Board, by regulations and rules which it adopts, is required by law to make the registry of deaths, births and marriages complete and perfect, and to adopt and maintain such regulations as are necessary for the proper sanitary care, removal and burial of the dead.

"Fourth. The Board is required to promptly recognize the presence of, and provide for the isolation and sanitary control of small-pox, diphtheria, and other contagious pests; and in doing this to report to the State Board of Health, and to seek whatever counsel and information may be needed to meet emergencies."

Incorporated villages have Boards similarly organized, which have similar duties to perform.

City Boards of Health.—Under the general Act of the State of New York, A.D, 1850, municipal councils were by law the health authorities in cities; but as remarked by Dr. Harris, "it was easily found, and has been often illustrated, that the identity of the municipal legislative board with the health board offers not only temptation and facilities for mal-administration and costs, which are wrong, but that expertness and efficiency in the sanitary service are rarely attained under such circumstances. It was for this reason that

* Whilst this report has been going through the press the Board has heard with deep regret of the death of this eminent and devoted sanitarian.

the Legislature in 1881 provided that it should be the duty of the common council of every city in the State (except in a few instances) to appoint a Board of Health, to consist of six persons who are not members of said council, and that the mayor shall be a member *ex-officio*, and also be president of the Board. Of the six members so appointed, (and 'one of whom shall be a competent physician') two are appointed annually after the first board is filled."

The above quotations have been made from the Annual Report of the State Board of Health of New York for 1882, because they show the most complete system and definite legislation for the formation of Local Boards of Health which has been adopted in any State of the Union.

The experience of that State, as of several other States of the Union in which the old plan of having councillors act as health officers was in operation, having shown that sanitary progress remained very slow indeed, it was decided in 1881 that something decisive in the direction of health legislation should be effected. According to Dr. Harris, the new system has been most fruitful in good results.

An example may now be taken from the old world illustrating how public health matters are managed there. For many reasons it is desirable that our illustrations should be selected from the health organizations of Great Britain and Ireland. Owing to differences existing in England, Scotland and Ireland in some of the old municipal methods of procedure and regulations, these countries have different Public Health Acts. The Acts now in force are the "Public Health Act" (Scotland) passed in 1867, the "Public Health Act" (Ireland) passed in 1874, and the "Public Health Act" (England) of 1872, consolidated in 1875.

Of these Acts those of England and Ireland are in most respects similar, and work well; that of Scotland is in some respects less perfect. A Local Board in England means any board constituted under the terms of the Public Health Act.

The whole of England, excepting London, is divided into urban and rural sanitary districts governed respectively by urban and rural sanitary authorities. An urban district is either a borough under the supervision of the mayor, aldermen and burgesses acting by the Council; an Improvement District under Improvement Commissioners; or a Local Government District under the Local Board. A rural sanitary district is any area not included under any of the foregoing, and the Guardians of the Union form the rural authority of such a district.

Besides the local sanitary authorities, there is the Local Government Board, to be referred to hereafter, which has supreme control in all matters relating to the public health.

On application to this Board a rural sanitary authority may be permitted to manage its own affairs through a Local Board, and make its district a Local Government District. Where any Local Board lapses, through its members ceasing to hold office, the owners and ratepayers of the district may elect a new Board, or the Local Government Board may declare such to be again a rural sanitary district, or cause, under compulsion, a new Board to be elected.

An application being made to the Local Government Board for the formation of a Local Board in any district, the Local Government Board may, when the application is found to be valid, determine according to circumstances the number and qualification of members, and may from time to time make changes in regard thereto.

The time and place for holding elections, and the qualifications of electors depend on residence, property, etc.

One-third, or as near as can be to one-third of the number of members elected go out of office on the fifteenth of April in each year.

It is worthy of remark that in cases where any Local Board had been established under the provisions of the Public Health Act of 1848, before the passing of the Local Government Act of 1858, its members were either members of the council, appointed on such Board by the council, or were selected by the council outside of their own number. The members of such Boards continued in office for one year, and no longer.

Now, it is a fact worthy of attention that, in both the instances of foreign Boards referred to, the original Boards were composed, as Boards are in Ontario at present,

either of members of the council or of persons appointed by them; and that in both cases such members held office for only one year. Further, it will also have been noticed that in both instances these Boards have been superseded by Boards formed wholly or in part of members not belonging to the common council; that they hold office for three years, and are, in the case of New York, composed of the Mayor and Clerk, along with Justices of the peace, and another citizen appointed by them; and in England they are elected by popular election.

3. *The Existing Powers and Duties of Local Boards.*—Under the terms of an Act respecting the Public Health, R. S. O., c. 190, no Local Board of Health, in the exact sense of the term, can exist in any municipality, except when a proclamation of the Lieutenant-Governor is in force, on account of the Province, or a portion of it, being invaded or threatened by formidable epidemic or endemic disease, in which case a Central Board and Local Boards of Health were to be called into existence. The Public Health Act of 1882 provides that the Provincial Board of Health may under such proclamation have and exercise all the powers of the Central Board of Health, under the terms of the first mentioned Act, but the Local Boards were given no proper permanent existence.

It has become customary, however, in popular language to call the health committee of any municipal council the Local Board of Health, while the term municipal health officers, applied in the Act to such health committees of the council, is now commonly applied to such medical men or others as may have been appointed Medical Health Officers or Sanitary Inspectors. Hence, although the expression "Local Boards of Health" is in one sense inapplicable here, such proclamation of the Lieutenant-Governor having rarely, if ever, been issued, still it has been so used because the term "Local Board" in other countries means Municipal Health Board, and because this term is in common use in Ontario to distinguish a Municipal from the Provincial Board of Health. The remarks then, under this section, will be understood to apply, not to Local Boards as designed by the Act, in sections 14–19, but to the committee of "Municipal Health Officers," as provided for in section 2, or to local boards of health, as understood in ordinary *parlance.*

Regarding the powers accorded to such committees or boards, it may be said that they are very considerable indeed; but it will be noticed that, in practice, the execution of the Act is most cumbersome. Take the following, (section 3): "The Health Officers of any municipality, or police village, or any two of them, may at any time, or as often as they think necessary, enter into and upon any premises in the place for which they hold office, and examine such premises."

Now, it will be remembered that in nearly all cases it is the council who are the health officers and who are to enter in or upon premises—or if not all the council, then, at least two of its members. Hence it appears that such examination of premises can be made only by two members at least of such committee. Do councillors consider that this is what they are elected for, and do they ever do it. Unless under most exceptional circumstances they do not.

There does not appear to be any power by which an Inspector, appointed by such council, can inspect premises, if the owner or occupant thereof refuses him admittance.

The next clause (section 4) is of great importance: "If upon examination they find that the premises are in a filthy or unclean state, or that anything is there which, in their opinion, may endanger public health, they or any two of them may order the proprietor or the occupant of the premises to cleanse the same, and to remove what is so found there."

It here appears then that it is only such Health Officers, and no single Inspector, that can order the cleansing up of premises, or the removal of nuisances.

Section 5 provides for the compulsory cleansing of premises or the removal of a nuisance, when, after the order of the council or two of its members, there has been neglect in its removal or abatement; but here again is the difficulty that the inspection and order can come only from the "health officers," so called under the Act, and not from the Medical Health Officer or Sanitary Inspector.

Section 6, providing for the examining of reputed cases of contagious diseases on any premises, makes it necessary to authorize at least two medical men to enter such premises and report on any case of disease found there. Hence it is comparatively useless in one sense, to have Medical Health Officers appointed under the present Act, since they

cannot perform their duties without the cumbersome additions noted above, or the consent of the householder or occupant. The above examination and reporting can only be legally done in the daytime; while if it be decided that such person should be removed to some hospital, this too can only be insisted upon in the daytime.

Section 7, providing for the removal of tenants or occupants from unsanitary buildings during the prevalence of any contagious or infectious diseases, similarly requires that the order therefor be given by the health officers or a majority of them.

It must from an examination of these sections appear, that there is at present no efficient means by which Local Boards of Health can easily, and in a practical manner, perform the duties which the Act confers upon them. It is not so much that their powers for good do not exist, as that the machinery for carrying them into effect is most defective. In addition to these powers conferred upon Municipal Health Officers by the Act of 1873, they may be required to perform other duties which may be defined by By-laws passed by the Council under the powers of the Municipal Act. Some of these are By-laws (1) "for regulating public wells and conveniences for water, and for preventing the wasting and fouling of public water;" (2) for preventing the use of deleterious materials in bread; (3) for seizing and destroying tainted and unwholesome meat, poultry, fish, &c.; (4) for preventing and abating public nuisances; (5) for providing against the spreading of contagious and infectious diseases; (6) for regulating the construction of cellars, sinks, water-closets, privies, and privy vaults, and the manner of draining the same; (7) for regulating slaughter-houses, offensive trades, etc.; (8) for the interment of the dead; (9) for cleansing the streets etc. It may, however, be a question how far the powers conferred upon the Municipal Health Officers, by the Health Act, would enable them efficiently to carry out such By-laws. However this may be, it has been abundantly illustrated in the first place that there are comparatively few municipalities which have by-laws for performing such work, and secondly, that if passed, the health committees are not organized for carrying them into effect.

4. *Necessity for a Change in the Constitution of Local Boards of Health.*—It is quite clear then from the experience in health matters gained in New York and other States as well as in England that the old methods of regulating sanitary affairs, however good in their intentions, have been lamentably deficient in results. The great saving of life effected by a change in them in the latter country has been referred to in the introductory pages of this report.

In Ontario also, which rejoices in conditions favourable to health which do not obtain to the same extent in more densely populated countries, past experience exhibits in sharp outline the inadequacy of the machinery for performing public health work. The direction, however, in which the necessary changes ought to be made is a subject surrounded with many difficulties. Following the line taken both in England and the State of New York it seems quite evident that some other body than the Municipal Council is required for performing sanitary work.

The reasons for this have been demonstrated on almost every page of this Report, but it is in keeping with the subject-matter of this chapter to gather them together and repeat them here, and to call earnest and serious attention to them. They may be stated thus:—

(1) Sanitary work, to be of much value or of a comprehensive nature, must be undertaken with a clear idea of the dangers to be averted, and the good to be attained; and it must be remembered that it is a scientific work, and that scientific methods must be adopted. This being the case it is not sufficient that any person, who may or may not have studied, or be willing to study, such subjects, should be appointed a member of a Health Committee simply because he has been elected a Municipal Councillor. Unfortunately, the attempts at systems of sewerage and water-supply found in many of our cities and towns make the force of this remark too evident.

(2) Assuming that there are members of councils qualified to be health officers, it is manifestly impossible for them, with the many other municipal matters requiring their attention, to give that time and care to sanitary measures which their difficult and important nature requires.

(3) The annual election of councillors prevents in too many cases their taking a broad

view of what public health necessities may require, since in many instances these may involve the adoption of extensive sanitary schemes, the immediate effect of which the popular mind may not at the time be capable of appreciating, and the good results of which cannot at once be seen. Naturally, then, members of councils are averse to advocating any measure which will make them unpopular.

Other reasons than the foregoing might possibly be adduced but these are sufficient to prove the necessity for a change in the present law.

Now, can anything be put forward which will be a decided improvement on the present Municipal Health Committee?

Taking the before-mentioned points in order, it may fairly be asserted that each municipality has citizens who, by education and position, may be fairly expected to take intelligent and scientific views of health matters. Physicians may naturally be expected to take an interest in such matters, and it is generally known that they are always active in whatever tends to improve the health and well-being of the people. It is, moreover, quite as true in Ontario as in New York, that the more intelligent members of every community are demanding that for sanitary, æsthetic and commercial reasons, organized efforts be made to produce in every community a better condition of affairs in regard to public health than was possible in the early days of settlement.

With reference to the second point mentioned, it is true, that even as things are at present, sanitary matters would receive more attention were not the minds of councillors occupied with many other important matters; nor does it need argument to prove that if a Board were appointed, whose special work it would be to deal with matters of health, these important concerns would not be simply allowed to continue unheeded, as in most cases they do at present. Almost every municipality has some citizens who, for the highest reasons, would be found ready to take an active interest in sanitary work.

The third point is so notoriously true, that further remark upon it is needless; while it must be as equally evident that a Board appointed for a longer period than one year, would be likely to take action which would be more comprehensive in character and less influenced by the many petty considerations which too frequently mark municipal legislation.

In outlining any system for the formation of Local Boards of Health, regard must be had for the genius of Municipal Institutions in general as they exist in Ontario. The nature of these has been already indicated. It will not, however, in any degree be doing violence to the municipal system to say that from the teachings of experience it seems most desirable that our Local Boards be formed in some similar manner to that employed at present in forming School Trustee Boards.

These are elected wholly by popular election; they are in many instances elected because of special fitness for the work; and, further, they are elected for a period of three years. But inasmuch as sanitary matters touch in many ways the work ordinarily looked upon as being the duty of councils, it would seem desirable that Local Boards have closer relations with the council than have Boards of School Trustees, and this may be provided for by having on the Local Board the Mayor (or Reeve) and Municipal Clerk. Further, the municipal machinery in Ontario is so simplified, that no good object could be served by adopting, to any extent, the complicated system of sanitary authorities, which vested rights, previous organizations, and varying conditions have made necessary in England; nor would it perhaps quite fulfil the necessary conditions, if the New York system of utilizing justices of the peace as health officers were adopted.

With all these things kept clearly in view, the following system has seemed to this Board to best fulfil the conditions, and to harmonize best with Ontario ideas.

Three classes of Boards varying slightly in their formation, ought to be established:—

First, in townships, incorporated villages, and towns with less than four thousand inhabitants, a Local Board might consist of the reeve or mayor, as the case may be, the municipal clerk (who would be the Secretary of the Board), and three other members to be elected at the time of, and under regulations similar to those for, the election of mayor or reeve, but who are not to be members of the council. For reasons stated, these elective members would, after the first organization of the Board, be elected each for a period of three years, one retiring each year.

Second, in towns with more than four thousand inhabitants and in cities, it would be desirable, since larger questions are involved and larger interests are at stake, to have a larger board and an increased number of members specially elected so that the entire attention of a greater number of persons would be directed to health matters. Such a board would probably be best composed of about six members elected at the same time as the mayor, and under similar regulations. Such members would, after the first organization of the Board, be elected for a period of three years, two members, or one-third retiring each year. In order to have a connecting link between the Health Board and the Municipal Council it would be desirable that the mayor be *ex officio* chairman of the Board. The secretary of the Board would be elected by it.

Third, where municipalities are sparsely peopled or poor, two or more might unite into one health district with its district board composed of the Mayor, or Reeve, the municipal Clerk, and one elective member from each such municipality, the chairman and secretary to be elected by the members of the Board.

Boards formed in these several ways would be required to report, by their secretary, the details of their organization to the Secretary of the Provincial Board, to hold regular meetings, and send to the Provincial Board an annual report of their work and the sanitary conditions of their respective districts. They would be expected to pass by-laws, appoint sanitary inspectors and medical health officers, and carry out the provisions of the Health Acts. By their chairman, who in all cases (except in district boards) would be the chairman of the council, they would present estimates of proposed expenditures, and for payment of the items of ordinary expenditure. In cases where any municipality persistently neglected to organize its board, it would seem desirable that the Provincial Board be empowered to take steps for the appointment of such a board.

Whatever faults such a system might in the future be found to have, it seems to present the most feasible plan for attaining the primary object of all provincial health legislation viz., that every municipality have a local board of health, as a separate and distinct organization, and that it be of such a character and so close in its relations to the Provincial Board, that it may not only be aided by it but may also aid the Provincial Board in establishing an organization powerful for good throughout the whole Province, and one which, it is hoped, would justly be looked upon as another stone in that national pillar of strength, the municipal system, of which it may be said, in the truest sense, that it is the government of the people by the people.

CHAPTER VIII.

THE POWERS AND DUTIES OF THE PROVINCIAL BOARD OF HEALTH.

1. *Necessity for its Existence.*—In the first annual report of this Board it was remarked that "In the establishment of a department, whose province and very *raison d' être*, it is to undertake the difficult office of preventing the outbreak and spread of disease, a step has been taken, the exact bearing and significance of which are not at once, by a mere casual glance, fully comprehended. It is the recognition of the principle that the State may, and ought to, exercise a paternal care over the health and lives of the people, not in any fitful or accidental manner, as during epidemics of disease, but in a daily supervision of the habits and manner of living of individuals and communities, in everything that tends to affect favourably or unfavourably the material well-being of the people, to speak of nothing more."

Proceeding on this principle, and recognizing in the prevailing sanitary conditions things requiring reform, the Government deputed this work to a Board which, from the attention its members have paid to sanitary matters, may be considered competent to deal with the many difficult questions demanding a solution. Such were the reasons which called for the creation of a Provincial Board of Health. The contents of previous chapters amply illustrate how its continuance is a necessity equally with its organization.

That the work of such a Board is of great importance, and that the thorough performance of this work demands great care and attention, may be gathered from a perusal of the following extract (Sec. 3, Public Health Act of 1882):—

"The Provincial Board of Health shall take cognizance of the interests of health and life among the people of the Province. They shall especially study the vital statistics of the Province, and shall endeavour to make an intelligent and profitable use of the collected records of deaths and sickness among the people; they shall make sanitary investigations and inquiries respecting causes of disease, and especially of epidemics; the causes of mortality and the effects of localities, employments, conditions, habits and other circumstances upon the health of the people; they shall make such suggestions as to the prevention and introduction of contagious and infectious diseases as they shall deem most effective and proper, and as will prevent and limit, as far as possible, the rise and spread of disease; and they shall, when required, or when they deem it best, advise officers of the Government and Local Boards of Health in regard to the public health and as to the means to be adopted to secure the same, and as to location, drainage, water supply, disposal of excreta, heating and ventilation of any public institution or building."

2. *The Extent and Nature of the Duties of the Provincial Board of Health.*—These are summed up in a large measure in the section of the Act just quoted, but how much each of the clauses of this section may mean, is worthy of a little consideration.

"They shall especially study the vital statistics of the Province." Such a recommendation implies, at the outset, that a profitable use might be made of these statistics. Unfortunately a careful study of them proves that they are not as accurate as they might be, partly owing to the fact that the public have not yet become so educated as to their importance, as to make the recording of them nearly as complete as should be; and they do not furnish as much exact information as is desirable to those who are labouring for the advancement of sanitary work throughout the Province. In spite of these drawbacks, the Board desires to acknowledge its obligations for much valuable information derived from the study of the vital statistics of the Province. It is at the same time respectfully submitted that the lack of closer relations between the department of the Registrar-General and the Provincial Board of Health has militated against the usefulness of these two sub-departments.

"They shall make sanitary investigations and inquiries respecting causes of disease." Allusions to this part of the duties of the Board have been so frequent in previous

chapters, that it is not necessary again to discuss them. The Board trusts that it has accomplished as much in this direction as has been possible under the circumstances. The details of the investigations found in Appendix D. of the report, indicate fully the direction in which this work has been prosecuted, and in Chapter IV. are stated some of the difficulties which had to be encounterd.

With reference to the next clause, that the Board shall make investigations into "causes of mortality and the influence of localities, employments," etc., "on the health of the people," it must be stated that no work of importance of this nature has been carried on, simply because there are no means at the command of the Board which would enable it to efficiently perform such work.

"They shall make such suggestions as to the prevention and introduction of contagious and infectious diseases as they shall deem most effective and proper." The labours of the Board in this field of duty have been very extensive, pamphlets bearing on this subject having been prepared and extensively circulated. The difficulty has been, however, that there have not been any organized efforts by which such information can be put into effective operation.

Regarding the power given the Board to advise officers of the Government concerning the location, water-supply and sewerage of public buildings, no arrangements have been made whereby the work thus deputed to them can be systematically carried into effect.

Further, the Secretary of the Board is empowered to use every practicable means for inducing Councils to appoint Local Boards of Health. It cannot be said, from the statements made in the last and previous chapters, that his labours, in this respect, have been crowned with a large amount of success.

From a perusal of this list of duties, it is apparent that they have a very wide scope, and are of very great importance, and that the people of the Province might look for large and beneficial results from the execution of them.

Now, while it may be admitted that the performance of these duties has resulted in much good, it must be apparent that all the results that might be expected do not necessarily follow the labours of the Board. The reason of this is evident from a perusal of the terms of the section already referred to, from which it will appear that the powers of the Board are simply of an advisory character, and while it may have abundant powers *to will* and advise, it has little power *to do*, or to put in operation needed reforms.

3. *Requirements of the Provincial Board for the Obtaining of the Practical Results of its Labours.*—Hitherto the sanitary work of the Board has been mainly of an advisory character. One of the reforms needed is to clothe the Board with executive powers so that when occasion calls for action, it may not require the pre-requisite of an order of the Lieutenant-Governor in Council, but may act as a matter of course. To give the Board these powers is to adopt a change in its character which will be most important and far-reaching in its results.

The first change involved in the new status of the Board would be in its relation to Municipal Boards. The suggestions made in the preceding chapter, if adopted, would require that such Boards be formed, and that they report to the Provincial Board. The latter would then be in duty bound to ascertain the way in which the work of any Local Board is being performed.

Looking at the points reviewed in the last chapter concerning the present status of Local Boards, it seems quite beyond doubt that something is absolutely required, if any marked advance in public health work is to be made. It has been clearly seen, both from the experience of other countries, and from that of Ontario during the ten years which have gone by since the passing of the Act respecting the Public Health, that there needs to be some law by which municipalities will be compelled to appoint Local Boards of Health, and that such Boards cannot be efficient as mere committees of Municipal Councils.

Experience, as illustrated throughout this Report, has shown that an advisory Board, simply, cannot obtain the accomplishment of the work, and hence a Board with more extended powers would seem to be a logical necessity. Such has been the experience of New York State and of Great Britain, as well as of several European countries. The relation of Government Boards to Local Boards has been shown; but it may be a

matter of interest to state some of the powers and duties of the Local Government Board of Great Britain.

This Board is the supreme authority in all matters relating to the public health; and it has also all the powers and duties of the Poor-Law Board. It has a general power over the acts of all local authorities, and various powers relating to public water-supplies, etc. All the powers and duties incident to the superintendence of the registration of births, marriages, and deaths are vested in it; and it issues regulations regarding drainage and all sanitary matters of a similar nature, public baths and wash-houses, town improvements, etc. It may, from time to time, make investigations under the Public Health Act, and it may direct the union of certain districts into Sanitary Districts, and enforce performance of duty by defaulting local authorities.

Such a Board was the result of the experience which years had brought of the inadequacy of voluntary municipal action for the proper performance of local Sanitary work. It has been already seen how, under the Act of 1848, the purely municipal method had been tried and failed; and it may further be asserted that it is due to the action of the Local Government Board that in public health work England has attained the first position amongst all European and other countries.

In the light of such examples as this gained concerning public work in England, we are forced to consider simply the two questions, viz.: First, the Government having undertaken the duty of protecting the interests of the people by the establishment of a Provincial Board of Health, can it effect the desired end by the powers which it has at the present time given to this Board? And second, if such powers as the Board possesses, do not enable it in some large measure to accomplish the desired results, is it not absolutely necessary that such increased power be given it as will effect that desired end? The whole review of the work of this Board shows that satisfactory results cannot be accomplished by it as at present constituted; and hence, the Board urges upon the attention of the Government the great importance of its work, and the vast issues depending upon it—the preservation of the lives and health of the people; and it asks for powers in some degree adequate for the purposes for which it was presumably created. Looked at from the standpoint of *work to be done* by the Board, it would seem that some of the following provisions are necessary:—

1. That the Provincial Board should have the duty imposed upon it, of seeing that the terms of an act requiring the formation of a Local Board in every municipality, or group of municipalities be fulfilled; and that it be empowered to take such action as will secure the formation of such boards in cases in which the local authorities neglect to do so.

2. That there should be adequate provisions whereby the Provincial Board shall obtain from the Local Boards full information of the sanitary condition of the various districts of the Province.

3. That when contagious disease is prevalent the Provincial Board have the duty imposed upon it of seeing that all possible measures are taken by Local Boards for its limitation and restriction; and that it have such powers as will enable it to insist upon the adoption of all necessary measures by such health authorities.

4. That where Local Boards neglect to deal with nuisances of a public character, it shall be the duty of the Provincial Board to see that they are effectually abated.

5. That when the establishment of systems of public water-supply and sewerage are undertaken by local authorities it shall be the duty of the Provincial Board to urge the adoption of such plans in the construction and carrying on of these works as will be most likely to secure permanent and lasting improvements in the public health.

The Provincial Board of Health in concluding this, its Second Annual Report, does so after having laboriously endeavoured during the two years of its existence to inform itself by every means possible, of the sanitary conditions which prevail in all parts of the Province, especially in large centres of population, such as villages, towns and cities; to inquire into the measures which have been, and are being, taken by the people as individuals, and by the health officers, which by municipal law exist amongst them; to estimate as far as has been possible, the adequacy and efficiency of the means employed, and whether they are proportionate to the amount and quality of the work to be per-

formed; and to come to a just and honest conclusion as to the relations and duties of the individual, the local health authorities, the Provincial Board of Health, and the Government in connection with the problem of the public health of the Province.

No useful end would be served by drawing an exaggerated picture of the evils which exist, or of proposing chimerical ideas for their removal. Nor yet would the Board be performing its duty to the public, were it to draw a rose-coloured picture of the health conditions of the Province. It has, consequently, been our effort to give, in as complete and lucid a manner as possible, a report of the sanitary condition of Ontario as it really is.

This report purports to give a plain unvarnished statement of all that has been done, and of much that requires to be done in connection with state medicine in this Province, and if Ontario has but little room for self-laudation, she has, in a relative sense, no cause for self-condemnation. The premier province of Canada in intelligence, wealth and material prosperity, she has been the first to occupy that large field of national reform, viz.: the care of the health of the people. Most prominent in filling her unoccupied lands with immigrants, she has likewise first resolved to make the preservation of the lives, health, and happiness of her people a public right and a public duty. Education has been her highest concern; municipal legislation has been her constant care; agriculture proudly bears evidence of her fostering protection; her industries are made a branch of Governmental interest; and religious freedom has ever been carefully guarded by her. In view of these numerous and great achievements in the elevation of her destiny, it is but fair to hope that the effort which has been auspiciously begun will not be permitted to become vain, but that this Province will continue to exhibit in sanitary matters that unfaltering purpose, that same steady advancement, that single-minded endeavour, that untiring perseverance which have given her the proud position she occupies in this federation of Provinces of the Dominion of Canada.

All which this Board respectfully submits to Your Honour.

WM. OLDRIGHT,
Chairman.

P. H. BRYCE,
Secretary.

PART II.

APPENDICES.

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning October, the 39 Diseases found in the vertical column; also the weekly and monthly numbers of tricts into which, for purposes of comparison, the Province is divided.

DISEASES.	District No. I.					District No. II.				
	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
	Oct. 7th.	Oct. 14th.	Oct. 21st.	Oct. 28th.		Oct. 7th.	Oct. 14th.	Oct. 21st.	Oct. 28th.	
1. Asthma (Spasmodic)	....	1	1	....	2	2	1	3	....	6
2. Anæmia	....	....	3	2	5	9	10	10	13	42
3. Accidents (Railroad, Machinery, etc.)	....	....	3	1	4	4	7	6	4	21
4. Blood Poisoning	....	2	....	....	2	....	1	1	2	4
5. Bright's Disease	....	....	....	....	......	2	1	1	..	4
6. Brain, Inflammation of	....	....	....	....	......	....	....	....	....	....
7. Bronchitis	1	3	7	9	20	8	6	8	8	30
8. Calculus	....	2	....	....	2	....	....	....	....	......
9. Cerebro-Spinal Meningitis	....	....	....	....	......	....	....	....	....	......
10. Cholera Infantum	....	....	....	....	...	4	1	1	....	6
11. Cholera Morbus	1	....	....	1	2	7	4	2	1	14
12. Consumption, Pulmonary	2	2	3	3	10	3	2	4	3	12
13. Croup, Membranous	....	....	....	....	......	....	....	....	....	......
14. Diphtheria	....	....	4	1	5	2	1	2	4	9
15. Diarrhœa	3	2	1	3	9	10	4	2	4	20
16. Dysentery	1	1	....	....	2	8	1	1	....	10
17. Erysipelas	....	1	1	1	3	2	....	....	3	5
18. Fever, Intermittent	....	....	1	....	1	11	12	6	5	34
19. Fever, Enteric	5	9	3	3	20	....	....	....	....	......
20. Fever, Typho-Malarial	2	2	....	....	4	4	2	....	1	7
21. Goitre	....	....	....	....	...	3	....	1	....	4
22. Gonorrhœa	....	2	3	....	5	3	2	1	....	6
23. Heart Disease, Organic	2	2	4	3	11	2	2	....	1	5
24. Influenza	3	5	4	1	13	....	2	3	1	6
25. Insanity	1	1	1	....	3	2	1	....	2	5
26. Measles	....	....	....	....	......	1	....	....	..	1
27. Mumps	....	....	....	....	......	....	....	20	10	30
28. Neuralgia	....	....	1	2	3	4	8	4	4	20
29. Peritonitis (non-puerperal)	1	....	....	....	1	....	2	2	....	4
30. Pneumonia	2	2	3	4	11	2	1	....	1	4
31. Pleurisy	....	....	1	2	3	2	4	1	1	8
32. Puerperal Fever	....	....	....	....	......	1	1	..	1	3
33. Rheumatism	....	1	2	6	9	4	1	3	6	14
34. Scarlatina	....	....	1	....	1	....	3	4	7	14
35. Small Pox	....	....	....	....	......	....	....	....	....	......
36. Syphilis	1	....	....	....	1	2	....	....	....	2
37. Tonsillitis	1	1	2	3	7	5	6	5	6	22
38. Tubercular Disease (other than pulmonary)	....	....	1	1	2	3	1	1	2	7
39. Whooping Cough	....	....	....	1	1	12	1	10	10	33
Total No. of Diseases	26	39	50	47	162	122	88	102	100	412
Number of Reporters for each week and month	1	2	4	3	10	6	6	6	6	24
	Average No. of Reporters for the four weeks of October, 2·50.					Average No. of Reporters for the four weeks of October, 4·00.				

1882, ending September 30th, 1883, showing the weekly and monthly totals for each of Reporters. Both Diseases and Reporters are arranged in accordance with the Ten Dis-

District No. III.					District No. IV.					District No. V.				
Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
Oct. 7th.	Oct. 14th.	Oct. 21st.	Oct. 28th.		Oct. 7th.	Oct. 14th.	Oct. 21st.	Oct. 28th.		Oct. 7th.	Oct. 14th.	Oct. 21st.	Oct. 28th.	
...	...	...	...	...	17	18	18	15	68	...	...	...	...	...
1	...	...	1	2	22	20	39	36	117	...	...	1	1	2
...	...	3	...	3	19	17	19	12	67	4	3	...	...	7
...	...	...	...	...	2	2	7	4	15	...	...	...	...	...
...	...	...	...	...	3	7	7	7	24	...	...	...	...	...
1	1	...	...	2	1	3	3	3	10	...	...	...	1	1
1	1	6	8	16	49	49	63	68	229	1	4	2	4	11
...	...	...	...	...	1	3	7	4	15	...	...	...	...	...
...	...	...	...	...	1	1	...	1	3	...	...	...	...	...
2	...	...	...	2	23	9	14	7	53	...	...	...	...	...
...	...	...	...	...	6	5	10	8	29	...	1	...	...	1
2	2	2	2	8	29	24	39	35	127	...	...	...	2	2
...	...	1	...	1	...	2	4	3	9	...	...	...	3	3
...	...	9	3	12	7	10	19	12	48	1	1	2	13	17
7	4	24	14	49	50	40	32	42	164	...	2	1	9	12
2	...	1	2	5	8	12	6	16	42	...	...	2	2	4
...	...	...	1	1	8	8	15	10	41	...	...	...	...	...
...	2	2	...	4	35	40	30	33	138	1	3	...	...	4
3	2	1	1	7	7	8	21	22	58	...	...	...	13	13
...	2	4	1	7	2	6	9	8	25	...	...	...	5	5
...	1	3	...	4	9	6	12	5	32	...	...	...	6	6
7	4	2	6	19	10	5	7	14	36	...	...	1	...	1
3	1	2	2	8	27	17	33	27	104	...	...	...	...	...
...	...	5	2	7	36	47	47	45	175	...	...	...	11	11
...	2	1	...	3	...	2	3	1	6	...	...	...	...	...
...	...	...	...	...	5	11	7	15	38	...	...	...	...	...
...	...	...	...	...	1	2	4	6	13	...	...	...	...	...
3	2	5	3	13	22	28	37	43	130	...	...	1	9	10
1	...	1	...	2	5	3	8	4	20	...	...	...	...	...
...	1	...	...	1	11	15	19	24	69	...	...	...	2	2
1	1	...	...	2	8	7	16	12	43	...	...	...	...	...
...	...	...	...	...	...	...	1	1	2	...	1	1	...	2
3	3	3	5	14	14	20	26	24	84	...	1	...	9	10
...	1	4	...	5	2	8	2	1	13	...	...	...	7	7
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	1	1	2	7	12	9	19	21	61	...	...	...	...	...
...	3	2	...	5	18	18	33	18	87	2	...	...	10	12
...	1	...	...	1	...	2	4	3	9	...	...	...	...	...
1	1	1	...	3	17	10	8	4	39	...	...	...	1	1
41	36	83	53	213	487	494	648	614	2243	9	16	11	108	144
2	2	3	2	9	13	14	19	19	65	1	1	1	2	5
Average No. of Reporters for the four weeks of October, 2·25.					Average No. of Reporters for the four weeks of October, 16·25.					Average No. of Reporters for the four weeks of October, 1·25.				

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. VI. Number of Cases for week ending Oct. 7th.	Oct. 14th.	Oct. 21st.	Oct. 28 th.	District No. VI. Total Cases for Month.	District No. VII. Number of Cases for week ending Oct. 7th.	Oct. 14th.	Oct. 21st.	Oct. 28th.	District No. VII. Total Cases for Month.
1. Asthma (Spasmodic)	11	10	14	15	50	1	....	3	2	6
2. Anæmia	23	31	35	25	114	7	4	13	7	31
3. Accidents (Railroad, Machinery, etc.)	16	19	21	22	78	2	2	....	3	7
4. Blood Poisoning	....	1	....	...	1	3	....	....	1	4
5. Bright's Disease	2	3	12	7	24	2	1	1	....	4
6. Brain, Inflammation of	1	2	....	2	5	....	....	....	....	.....
7. Bronchitis	32	43	46	69	190	6	4	16	22	48
8. Calculus	....	4	8	1	13	....	...	....	....	.. .
9. Cerebro-Spinal Meningitis	2	1	....	....	3	....	....	....	....	....
10. Cholera Infantum	21	11	11	10	53	4	2	3	....	9
11. Cholera Morbus	22	10	3	2	37	2	....	....	....	2
12. Consumption, Pulmonary	16	28	22	22	88	8	9	10	14	41
13. Croup, Membranous	....	2	2	1	5	1	....	....	....	1
14. Diphtheria	16	17	11	15	59	....	4	2	....	6
15. Diarrhœa	34	42	30	27	133	16	15	22	7	60
16. Dysentery	8	10	11	11	40	3	....	5	1	9
17. Erysipelas	1	4	6	7	18	....	....	1	2	3
18. Fever, Intermittent	11	13	15	12	51	17	12	14	8	51
19. Fever, Enteric	23	25	24	26	98	2	2	4	6	14
20. Fever, Typho-Malarial	11	6	6	1	24	3	5	5	3	16
21. Goitre	6	9	11	14	40	1	1	1	3	6
22. Gonorrhœa	11	15	17	7	50	....	....	2	2	4
23. Heart Disease, Organic	4	8	9	14	35	5	....	3	4	12
24. Influenza	25	29	32	40	126	17	1	27	12	57
25. Insanity	2	1	5	4	12	1	....	1	....	2
26. Measles	3	7	12	14	36	....	....	....	....	......
27. Mumps	1	3	2	5	11	1	....	....	....	1
28. Neuralgia	20	23	39	21	103	6	7	19	10	42
29. Peritonitis (non-puerperal)	4	2	1	4	11	....	....	....	....	......
30. Pneumonia	12	9	11	17	49	6	7	5	2	20
31. Pleurisy	4	6	4	5	19	....	....	2	1	3
32. Puerperal Fever	....	1	1	....	2	....	....	....	....	......
33. Rheumatism	12	27	26	27	92	1	....	....	1	2
34. Scarlatina	15	9	11	3	38	...	3	5	4	12
35. Small Pox	....	1	....	....	1	....	....	....	....	.....
36. Syphilis	7	7	13	6	33	1	1	4	3	9
37. Tonsillitis	13	11	19	22	65	1	1	....	1	3
38. Tubercular Diseases (other than pulmonary)	1	2	7	6	16	1	....	....	....	1
39. Whooping Cough	8	....	1	....	9	10	6	2	....	18
Total No. of Diseases	398	452	498	484	1832	128	87	170	119	504
Number of Reporters for each week and month	13	14	15	15	57	4	3	5	5	17
	Average No. of Reporters for the four weeks of October, 14·25.					Average No. of Reporters for the four weeks of October, 4·25.				

October, 1882, ending September 30, 1883—*Continued.*

District No. VIII.					District No. IX.					District No. X.				
Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
Oct. 7th.	Oct. 14th.	Oct. 21st.	Oct. 28th.		Oct. 7th.	Oct. 14th.	Oct. 21st.	Oct. 28th.		Oct. 7th.	Oct. 14th.	Oct. 21st.	Oct. 28th.	
...	...	3	6	9	1	3	...	...	4	11	1	2	5	19
...	...	...	...	...	1	1	...	2	4	3	4	4	7	18
...	...	...	...	...	...	1	...	...	1	7	4	4	1	16
...	...	2	1	3	1	...	...	...	1	7	...	1	1	9
...	...	...	2	2	...	1	...	...	1	2	1	3	2	8
...	...	...	...	...	...	1	...	...	1	2	...	...	...	2
2	...	...	...	2	1	12	4	2	19	6	2	15	17	40
...	...	...	1	1	...	...	...	...	...	...	...	...	2	2
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	1	...	1	...	...	...	...	...	2	...	...	...	2
3	1	2	2	8	...	1	...	...	1	3	1	1	...	5
...	...	7	7	14	1	3	...	...	4	1	...	8	7	16
...	...	...	...	...	...	1	...	3	4	...	...	...	1	1
...	...	4	2	6	...	...	...	...	...	2	...	...	1	3
...	2	4	2	8	1	4	2	4	11	8	3	4	2	17
...	1	...	2	3	1	2	1	...	4	2	...	2	3	7
...	...	...	...	...	...	...	...	1	1	1	2	2	1	6
40	20	41	37	138	1	...	2	2	5	30	21	42	34	127
...	...	3	3	6	...	1	...	2	3	10	7	9	7	33
...	...	...	...	...	...	1	...	...	1	1	4	3	6	14
...	...	2	3	5	1	...	...	2	3	...	...	...	2	2
2	...	1	5	8	...	1	1	...	2	5	6	1	3	15
...	...	15	...	15	...	...	...	1	1	4	3	2	2	11
...	...	...	15	15	...	...	2	2	4	7	6	2	2	17
...		3	...	3	...	...	...	...	...	3	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	4	...	...	4
3	2	17	13	35	1	6	6	4	17	4	...	3	6	13
...	...	1	...	1	1	1	...	2	4	...	2	2	1	5
...	...	12	8	20	1	1	4	2	8	2	...	...	1	3
...	...	...	...	...	1	3	...	...	4	2	1	1	...	4
...	...	1	...	1	...	1	...	...	1	...	1	...	...	1
2	1	2	4	9	1	3	1	...	5	6	3	4	6	19
...	...	...	2	2	...	...	...	...	...	...	...	1	...	1
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	1	1	...	...	...	...	...	2	...	1	2	5
...	...	1	...	1	2	1	...	1	4	1	2	4	2	9
...	...	...	1	1	...	...	...	...	...	...	...	1	1	2
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
52	27	122	117	318	16	49	23	30	118	134	78	122	125	459
1	1	2	2	6	1	3	2	2	8	5	4	7	7	23
Average No. of Reporters for the four weeks of October, 1·50.					Average No. of Reporters for the four weeks of October, 2·00.					Average No. of Reporters for the four weeks of October, 5·75.				

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. I. — Number of Cases for week ending Nov. 4th.	Nov. 11th.	Nov. 18th.	Nov. 25th.	Total Cases for Month.	District No. II. — Number of Cases for week ending Nov. 4th.	Nov. 11th.	Nov. 18th.	Nov. 25th.	Total Cases for Month.
1. Asthma (Spasmodic)	1	....	3	....	4	6	4	4	4	18
2. Anæmia	4	5	5	3	17	9	14	19	19	61
3. Accidents (Railroad, Machinery, etc.)	2	2	1	4	9	7	6	3	14	30
4. Blood Poisoning	....	....	....	....	....	....	....	....	1	1
5. Bright's Disease	1	1	1	1	4	....	1	1	....	2
6. Brain, Inflammation of	....	....	....	....	....	....	....	1	1	2
7. Bronchitis	8	8	4	13	33	13	16	17	18	64
8. Calculus	....	....	1	....	1	....	1	....	....	1
9. Cerebo-Spinal Meningitis	....	....	....	....	....	....	....	....	1	1
10. Cholera Infantum	....	....	....	....	....	....	....	1	....	1
11. Cholera Morbus	2	1	....	....	5	....	....	1	....	1
12. Consumption, Pulmonary	3	3	3	7	16	4	2	9	7	22
13. Croup, Membranous	....	....	....	....	....	....	....	....	3	3
14. Diphtheria	....	1	1	4	6	1	2	1	3	7
15. Diarrhœa	3	....	6	4	13	7	8	7	9	31
16. Dysentery	....	4	1	.	5	....	2	....	....	2
17. Erysipelas	....	....	....	1	1	3	3	3	11	20
18. Fever, Intermittent	....	....	....	....	....	6	8	6	2	22
19. Fever, Enteric	3	1	2	4	10	2	3	2	7	14
20. Fever, Typho-Malarial	....	....	....	....	....	1	....	4	1	6
21. Goitre	....	....	2	1	3	....	2	4	4	10
22. Gonorrhœa	2	3	5	4	14	....	2	2	2	6
23. Heart Disease, Organic	2	1	4	3	10	1	1	2	....	4
24. Influenza	4	3	7	5	19	1	7	7	5	20
25. Insanity	1	....	..	1	2	....	3	4	1	8
26. Measles	....	....	....	....	....	2	....	....	....	2
27. Mumps	....	....	...	1	1	10	7	18	11	46
28. Neuralgia	3	2	3	8	16	5	6	15	17	43
29. Peritonitis (non-puerperal)	....	....	....	....	....	1	2	1	4	8
30. Pneumonia	4	1	1	4	10	....	3	2	1	6
31. Pleurisy	3	....	2	....	5	2	4	3	3	12
32. Puerperal Fever	....	..	....	....	....	1	2	1	....	4
33. Rheumatism	....	2	6	2	10	5	4	5	7	21
34. Scarlatina	2	1	1	2	6	1	5	5	1	12
35. Small Pox	....	....	....	....	....	....	....	....	....	....
36. Syphilis	1	1	....	3	5	....	....	....	1	1
37. Tonsillitis	1	4	1	8	14	2	7	3	9	21
38. Tubercular Disease (other than pulmonary)	3	3	3	3	12	1	1	1	....	3
39. Whooping Cough	1	...	1	....	2	13	14	16	24	67
Total No. of Diseases	54	47	64	86	251	104	140	168	191	603
Number of Reporters for each week and month	3	3	4	6	16	6	7	8	9	30
	Average No. of Reporters for the four weeks of November, 4·00.					Average No. of Reporters for the four weeks of November, 7·50.				

October, 1882, ending September, 30th, 1883—*Continued.*

District No. III.					District No. IV.					District No. V.				
Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
Nov. 4th.	Nov. 11th.	Nov. 18th.	Nov. 25th.		Nov. 4th.	Nov. 11th.	Nov. 18th.	Nov. 25th.		Nov. 4th.	Nov. 11th.	Nov. 18th.	Nov. 25th.	
.....	.....	.....	.....	.....	23	16	19	26	84	7	2	.....	4	13
3	1	.....	3	7	34	30	31	46	141	.....	1	.....	5	6
1	2	3	3	9	26	15	18	26	85	.....	2	.....	5	7
.....	.....	.....	.....	.....	11	3	5	6	25	2	1	.....	2	5
.....	.....	.....	1	1	15	9	14	18	56	.....	.....	.....	2	2
.....	.....	.....	1	1	4	1	5	5	15	12	.....	.....	.....	12
13	4	17	8	42	67	68	71	94	300	.....	6	.....	17	23
.....	.....	.....	.....	.....	1	1	2	2	6	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	1	.....	1	2	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	5	2	3	6	16	2	.....	.....	.....	2
.....	.....	.....	.....	.....	9	.....	5	6	20	.....	.....	.....	.....	.....
1	2	1	3	7	38	28	23	41	130	5	4	.....	8	17
1	.....	.....	1	2	8	1	1	3	13	4	.....	.....	1	5
1	.....	.....	.....	1	11	7	8	18	44	1	1	.....	2	4
21	25	50	53	149	40	34	19	25	118	8	2	.....	5	15
.....	.....	1	.....	1	11	3	4	2	20	1	2	.....	.....	3
2	1	.....	1	4	12	9	5	15	41	.....	2	.....	2	4
1	3	.....	.....	4	20	13	29	29	91	.....	.....	.....	.....	.....
2	.....	4	4	10	20	16	13	17	66	12	.....	.....	.....	12
4	.....	.....	.....	4	10	9	4	11	34	15	5	.....	12	32
3	.....	1	1	5	8	7	12	13	40	11	.....	.....	27	38
4	2	3	7	16	17	14	12	15	58	3	2	.....	5	10
2	2	1	1	6	30	22	20	29	101	.....	.....	.....	1	1
11	11	8	4	34	50	38	48	60	196	10	.....	.....	.....	10
.....	.....	.....	1	1	.....	3	8	2	13	1	.....	.....	1	
.....	.....	.....	.....	.....	13	18	14	13	58	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	6	8	4	3	21	.....	.....	.....	2	2
5	7	4	7	23	45	25	36	54	160	4	3	.....	10	17
.....	.....	.....	.....	.....	14	8	6	7	35	.....	.....	.....	.....	.....
1	1	2	3	7	14	15	28	32	89	.....	1	.....	8	9
1	1	2	4	8	5	5	12	17	39	2	2	.....	1	5
1	.....	.....	.....	1	.....	2	2	2	6	1	.....	.....	.....	1
5	6	5	12	28	18	23	33	51	125	5	1	.....	2	8
.....	.....	.....	.....	.....	17	.....	3	10	30	.....	8	.....	7	15
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	.....	2	5	9	24	15	17	26	82	2	1	.....	3	6
4	1	1	1	7	21	18	23	34	96	9	2	.....	6	17
.....	.....	.....	.....	.....	2	3	4	2	11	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	7	3	11	2	23	.....	.....	.....	1	1
89	69	105	124	387	656	493	572	769	2490	117	48	.....	139	304
3	2	2	3	10	21	14	19	24	78	3	2	.....	5	10
Average No. of Reporters for the four weeks of November, 2·50.					Average No. of Reporters for the four weeks of November, 19·50.					Average No. of Reporters for the four weeks of November, 2·50.				

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. VI. Number of Cases for week ending Nov. 4th.	Nov. 11th.	Nov. 18th.	Nov. 25th.	Total Cases for Month.	District No. VII. Number of Cases for week ending Nov. 4th.	Nov. 11th.	Nov. 18th.	Nov. 25th.	Total Cases for Month.
1. Asthma (Spasmodic)	8	11	5	8	32	2	4	....	1	7
2. Anæmia	34	17	31	39	121	11	13	13	13	50
3. Accidents (Railroad, Machinery, etc.)	13	12	20	24	69	4	3	1	1	9
4. Blood Poisoning	....	....	2	3	5	1	....	....	....	1
5. Bright's Disease	8	5	2	12	27	....	1	....	1	2
6. Brain, Inflammation of	1	3	2	6	12	....	1	....	....	1
7. Bronchitis	54	43	80	78	255	27	26	23	26	102
8. Calculus	...	1	2	1	4	....	....	....	....	....
9. Cerebro-Spinal Meningitis	....	....	....	....	......	....	...	...	.. .	......
10. Cholera Infantum	5	2	....	....	7	....	1	...	....	1
11. Cholera Morbus	2	3	1	....	6	....	....	.	...	......
12. Consumption, Pulmonary	16	13	21	27	77	12	7	9	11	39
13. Croup, Membranous	....	1	2	9	12	....	....	....	1	1
14. Diphtheria	19	11	19	52	101	2	....	....	....	2
15. Diarrhœa	21	17	11	8	57	5	9	8	5	27
16. Dysentery	5	4	3	1	13	1	1	1	1	4
17. Erysipelas	5	3	7	8	23	2	1	1	1	5
18. Fever, Intermittent	17	11	15	16	59	12	14	14	6	46
19. Fever, Enteric	14	6	17	14	51	2	....	....	...	2
20. Fever, Typho-Malarial	3	....	3	3	9	1	3	1	1	6
21. Goitre	5	10	16	12	43	3	2	1	....	6
22. Gonorrhœa	10	12	11	11	44	1	2	3	3	9
23. Heart Disease, Organic	18	6	7	7	38	6	5	6	5	22
24. Influenza	13	20	48	60	141	10	11	15	24	60
25. Insanity	2	3	3	3	11	...	1	1	....	2
26. Measles	14	.	11	13	38	....	....	....	....	....
27. Mumps	....	2	5	....	7	2	2	2	1	7
28. Neuralgia	24	15	26	42	107	10	10	15	18	53
29. Peritonitis (non-puerperal)	3	2	2	4	11	....	1	3	2	6
30. Pneumonia	10	8	13	20	51	4	5	4	5	18
31. Pleurisy	1	4	5	5	15	....	2	....	....	2
32. Puerperal Fever	....	....	....	....	......	....	....	....	....	......
33. Rheumatism	20	17	24	23	84	4	5	6	8	23
34. Scarlatina	3	4	19	17	43	2	3	2	2	9
35. Small Pox	....	....	....	..	...	....	....	....	....	......
36. Syphilis	8	3	8	8	27	2	....	1	2	5
37. Tonsillitis	8	14	24	25	71	1	1	2	3	7
38. Tubercular Disease (other than pulmonary)	2	1	4	4	11	....	....	....	....	......
39. Whooping Cough	10	4	24	19	57	....	....	....	...	......
Total No. of Diseases	376	288	493	582	1739	127	134	132	141	534
Number of Reporters for each week and month	14	10	15	16	55	4	5	5	5	19
	Average No. of Reporters for the four weeks of November, 13·75.					Average No. of Reporters for the four weeks of November, 4·75.				

October, 1882, ending September 30th, 1883—*Continued.*

District No. VIII.					District No. IX.					District No. X.				
Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
Nov. 4th.	Nov. 11th.	Nov. 18th.	Nov. 25th.		Nov. 4th.	Nov. 11th.	Nov. 18th.	Nov. 25th.		Nov. 4th.	Nov. 11th.	Nov. 18th.	Nov. 25th.	
3	2	2	1	8	.....	...	1	2	3	3	3	4	3	13
1	1	.....	.....	2	.....	2	.....	1	3	10	20	6	7	43
1	.....	.....	2	3	1	....	1	.....	2	6	6	4	5	21
..	.....	.....	.....	.....	1	.....	.....	.....	1	.....	3	1	1	5
2	.....	.....	.....	2	.....	.....	....	1	1	4	1	.....	1	6
.....	.....	.....	.....	.....	1	1	.....	1	3	.....	.....	.....	.....	.....
9	.....	5	6	20	6	4	2	2	14	16	39	28	21	104
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	2	.....	.....	4
.....	.....	.....	.....	.....	.....	.....	.....	.....	....	.....	.....	.....	.....	.....
.....	2	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	1	1	.....	.....	2	.....	2	2	.....	4
8	...	.....	.....	8	1	.....	1	1	3	10	11	8	12	41
.....	.....	.....	.....	.....	2	.....	1	.....	3	.....	.....	.....	2	2
6	.....	.....	1	7	4	1	1	8	14	2	.....	6	12	20
7	2	.....	1	10	3	2	2	2	9	2	1	1	4	8
.....	1	.....	.....	1	.....	1	1	1	3	2	.....	.....	.....	2
2	.....	.....	10	12	2	.....	.....	1	3	4	4	5	7	20
31	13	13	.....	57	2	2	1	.....	5	36	42	31	30	139
3	1	.....	.....	4	2	.....	.....	.....	2	9	9	4	6	28
2	.....	.....	.....	2	.....	.....	.....	.....	.....	14	7	5	5	31
3	1	1	.....	5	1	1	1	.....	3	2	1	1	1	5
6	1	1	2	10	.....	.....	.....	.....	.....	5	6	1	8	20
14	1	.....	....	15	1	....	2	1	4	3	1	4	4	12
20	.....	1	.....	21	7	5	4	3	19	3	4	5	7	19
.....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....
.....	3	.....	.....	3	.....	1	3	3	7	.....	1	2	.....	3
.....	....	3	6	9	1	1	4	4	10	3	.....	.....	.....	3
15	12	8	13	48	3	5	2	5	15	8	13	14	11	46
1	1	....	.....	2	.....	.....	.....	.....	.....	1	6	6	1	14
11	1	2	....	14	3	3	1	2	9	2	1	3	7	13
2	.....	.....	.....	2	.....	1	1	.....	2	1	4	2	3	10
.....	.....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1
6	4	1	.....	11	.....	1	1	1	3	7	10	7	7	31
12	6	2	1	21	11	.....	.....	3	14	2	.....	5	3	10
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1
1	.....	1	1	3	.....	.....	.....	.....	.....	4	1	3	4	12
4	8	4	3	19	2	2	2	2	8	.....	1	5	7	13
1	...	.....	.....	1	.....	.....	.....	1	1	.....	.....	1	1	2
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	1	1	4
171	60	44	47	322	55	34	32	46	167	162	201	165	182	710
4	3	3	3	13	3	2	2	3	10	8	8	7	8	31
Average No. of Reporters for the four weeks of November, 3·25.					Average No. of Reporters for the four weeks of November, 2·50.					Average No. of Reporters for the four weeks of November, 7·75.				

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. I.						District No. II.					
	Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.
	Dec. 2nd.	Dec. 9th.	Dec. 16th.	Dec. 23rd.	Dec. 30th.		Dec. 2nd.	Dec. 9th.	Dec. 16th.	Dec. 23rd.	Dec. 30th.	
1. Asthma (Spasmodic)	1	2	2	1	1	7	4	....	2	2	3	11
2. Anæmia	3	2	6	6	5	22	17	11	14	22	17	81
3. Accidents (Railroad, Machinery, etc.)	3	2	3	3	1	12	7	4	5	8	8	32
4. Blood Poisoning	1	1	1	1	....	4	2	....	....	....	....	2
5. Bright's Disease	....	1	2	1	....	4	....	1	....	2	1	4
6. Brain, Inflammation of	....	....	....	....	....	....	1	....	....	6	....	7
7. Bronchitis	14	15	12	14	16	71	26	21	20	24	27	118
8. Calcalus	....	....	....	....	....	....	....	....	....	1	1	2
9. Cerebro-Spinal Meningitis	....	....	....	....	....	....	....	1	1	....	....	2
10. Cholera Infantum	....	....	....	....	1	1	....	....	2	1	2	5
11. Cholera Morbus	1	2	1	....	1	5	....	....	....	....	....	....
12. Consumption, Pulmonary	6	5	9	8	5	33	2	5	4	5	8	24
13. Croup, Membranous	....	2	....	....	1	3	....	2	2	....	2	6
14. Diphtheria	7	9	4	2	2	24	3	7	17	2	8	37
15. Diarrhœa	4	8	5	3	9	29	9	6	4	9	6	34
16. Dysentery	....	....	1	....	....	1	....	1	....	....	....	1
17. Erysipelas	....	2	1	2	1	6	9	6	5	3	2	25
18. Fever, Intermittent	....	....	2	....	....	2	3	8	9	14	4	38
19. Fever, Enteric	4	5	2	3	2	16	3	....	3	2	1	9
20. Fever, Typho-Malarial	....	....	....	....	....	....	4	1	1	1	1	8
21. Goitre	1	2	2	2	....	7	3	....	4	2	....	9
22. Gonorrhœa	7	6	9	6	1	29	2	1	2	....	4	9
23. Heart Disease, Organic	5	7	7	5	2	26	2	1	2	3	3	11
24. Influenza	4	7	11	10	7	39	6	10	18	10	25	69
25. Insanity	1	....	....	....	....	1	3	2	1	....	....	6
26. Measles	....	....	....	....	....	....	....	....	....	1	....	1
27. Mumps	3	4	5	3	1	16	12	20	13	9	6	60
28. Neuralgia	12	5	8	10	6	41	12	15	10	14	16	67
29. Peritonitis (non-puerperal)	2	....	....	1	....	3	2	1	1	....	1	5
30. Pneumonia	2	1	....	....	3	6	1	3	5	8	2	19
31. Pleurisy	....	1	1	1	....	3	3	1	2	3	3	12
32. Puerperal Fever	3	....	....	....	....	3	....	....	....	....	....	....
33. Rheumatism	1	5	4	9	3	22	7	7	8	5	12	39
34. Scarlatina	1	....	2	1	....	4	1	....	....	....	....	1
35. Small Pox	....	....	....	....	....	....	....	....	....	....	....	....
36. Syphilis	2	1	1	2	....	6	1	1	1	2	....	5
37. Tonsillitis	8	11	10	7	3	39	9	9	18	10	12	58
38. Tubercular Disease (other than pulmonary)	1	2	3	2	4	12	1	....	1	....	3	5
39. Whooping Cough	1	3	5	3	2	14	13	14	21	10	22	80
Total No. of Diseases	98	111	119	106	77	511	168	159	196	179	200	902
Number of Reporters for each week and month	5	6	5	6	3	25	9	7	8	9	8	41
	Average No. of Reporters for the five weeks of December, 5·00.						Average No. of Reporters for the five weeks of December, 8·20.					

October 1882, ending September 30th, 1883—*Continued.*

District No. III.						District No. IV.						District No. V.					
Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.
Dec. 2nd.	Dec. 9th.	Dec. 16th.	Dec. 23rd.	Dec. 30th.		Dec. 2nd.	Dec. 9th.	Dec. 16th.	Dec. 23rd.	Dec. 30th.		Dec. 2nd.	Dec. 9th.	Dec. 16th.	Dec. 23rd.	Dec. 30th.	
..	....	....	....	....	......	23	18	19	28	7	95	7	6	1	......	1	15
1	....	2	1	....	4	50	39	43	41	38	211	8	6	8	9	8	39
3	....	3	1	....	7	18	18	19	26	12	93	6	8	4	5	5	28
....	....	....	....	....	......	4	7	6	4	3	24	......	......	3	5	2	10
1	1	....	....	....	2	12	15	13	9	9	58	3	3	4	5	2	17
1	1	1	1	....	4	5	2	3	6	4	20	.. ..	......	1	1	1	3
19	4	7	8	2	40	97	88	84	89	66	424	16	48	17	13	16	110
....	....	....	....	....	......	6	4	5	4	4	23	1	.....	......	......	......	1
....	....	....	....	....	......	....	1	....	1	....	2	....	......	......	......	......	......
....	....	....	....	....	......	2	2	1	..	...	5	......	......	......	......	......	......
....	....	....	....	....	......	3	1	1	1	4	10	......	......	......	......	......	....
1	....	....	....	....	1	38	36	27	31	34	166	12	11	6	7	8	44
....	....	....	....	....	......	5	5	4	1	....	15	2	......	4	1	1	8
2	2	....	2	3	9	12	12	10	5	9	48	1	1	2	1	4	9
23	1	18	5	....	47	25	25	17	22	19	108	6	4	3	......	1	14
....		2	....	....	2	11	4	4	4	2	25	......	2	......	......	1	3
1	1	1	2	..	5	12	13	13	18	4	60	1	......	......	1	1	3
1	....	1	....	....	2	24	25	22	17	15	103	2	......	2	2	1	7
1	2	1	2	....	6	14	21	13	15	7	70	7	.....	2	1	1	11
....	....	....	....	....	......	10	10	12	6	3	41	3	1	1	......	1	6
1	2	2	....	....	5	12	8	9	14	6	49	69	64	5	4	4	146
4	2	4	2	....	12	15	14	10	8	10	57	4	3	......	. ..	....	7
1	....	1	4	....	6	31	28	27	28	24	138	......	2	2	3	2	9
35	4	33	50	...	122	63	65	63	67	56	314	12	3	4	. ...	4	23
....	..	....	....	...	......	5	4	4	....	4	17	......	2	1	2	3	8
....	2	....	4	4	10	15	16	9	10	12	62	1	......	......	......	....	1
....	....	....	....	....	......	3	6	7	2	2	20	3	.....	1	5	5	14
7	3	8	4	2	24	53	39	43	50	40	225	10	13	9	9	8	49
....	....	....	....	....	......	7	3	3	4	3	20	.....	3	1	1	1	6
1	....	4	5	2	12	28	24	21	19	20	112	10	7	2	3	4	26
1	3	1	3	2	10	11	18	14	9	6	58	2	3	3	2	3	13
....	....	....	....	....	.....	3	6	2	1	2	14	....	......	......	......	1	1
17	5	6	6	....	34	36	35	29	41	32	173	......	3	2	5	4	14
....	2	4	4	3	12	23	14	8	4	8	57	7	7	6	7	7	34
....	....	.. .	....	....	......	....	....	....	....	....	....	......	......	......	......	......	..
....	....	....	....	....	......	23	18	8	14	10	73	3	3	2	3	4	15
2	1	6	6	2	17	28	22	41	32	25	148	7	4	3	4	6	24
....	....	....	....	....	......	9	7	1	2	3	22	......	...	1	1	1	3
....	...	....	....	....	......	3	11	10	13	13	50	2	2	......	.....	......	4
123	36	105	109	20	393	739	684	625	646	516	3210	205	209	100	100	111	725
3	2	2	3	1	11	24	21	20	17	17	99	6	5	4	4	4	23
Average No. of Reporters for the five weeks of December, 2·20.						Average No. of Reporters for the five weeks of December, 19·80.						Average No. of Reporters for the five weeks of December, 4·60.					

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. VI.						District No. VII.					
	Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.
	Dec. 2nd.	Dec. 9th.	Dec. 16th.	Dec. 23rd.	Dec. 30th.		Dec. 2nd.	Dec. 9th.	Dec. 16th.	Dec. 23rd.	Dec. 30th.	
1. Asthma (Spasmodic)	5	9	8	7	9	38	3	....	1	2	3	9
2. Anæmia	37	29	32	27	40	165	11	9	7	13	6	46
3. Accidents (Railroad, Machinery, etc.)	21	20	9	16	21	87	1	2	4	5	6	18
4. Blood Poisoning	2	9	2	4	5	22	....	...	....	2	1	3
5. Bright's Disease	7	12	6	5	6	36	1	1	1	1	1	5
6. Brain, Inflammation of	2	2	3	2	....	9	....	....	1	1	1	3
7. Bronchitis	90	83	68	54	81	376	27	36	37	38	35	173
8. Calculus	....	3	4	2	5	14	....	....	....	....	....	.....
9. Cerebro-Spinal Meningitis	1	....	....	....	1	2	....	....	....	2	2	4
10. Cholera Infantum	....	6	....	....	...	6	....	....	...	....	....	.....
11. Cholera Morbus	....	6	....	....	1	7	....	....	....	....	....	.....
12. Consumption, Pulmonary	19	19	17	20	28	103	9	11	7	8	11	46
13. Croup, Membranous	5	3	2	2	6	18	1	....	....	1	....	2
14. Diphtheria	30	41	17	19	28	135	....	....	2	1	....	3
15. Diarrhœa	14	9	6	9	12	50	8	7	4	9	7	35
16. Dysentery	1	..	1	....	1	3	....	....	..	....	....	.....
17. Erysipelas	9	12	7	10	8	46	....	2	1	1	1	5
18. Fever, Intermittent	21	19	12	4	6	62	9	11	9	9	13	51
19. Fever, Enteric	10	6	7	2	1	26	2	2	1	1	1	7
20. Fever, Typho-Malarial	1	1	3	6	3	14	....	2	3	4	2	11
21. Goitre	15	17	5	9	9	55	2	2	2	1	1	8
22. Gonorrhœa	9	18	14	12	14	67	3	3	4	....	....	10
23. Heart Disease, Organic	13	14	13	12	15	67	5	8	6	5	9	33
24. Influenza	43	34	44	40	30	191	11	15	9	9	16	60
25. Insanity	3	2	4	3	2	14	1	....	....	....	1	2
26. Measles	10	11	6	....	5	32	....	....	....	....	....	.....
27. Mumps	2	4	3	5	6	20	3	....	2	1	....	6
28. Neuralgia	33	26	27	27	45	158	14	23	21	19	25	102
29. Peritonitis (non-puerperal)	3	11	2	4	8	28	2	·2	.. .	2	1	7
30. Pneumonia	28	19	21	16	23	107	9	6	2	8	5	30
31. Pleurisy	4	8	8	3	6	29	1	1	1	1	1	5
32. Puerperal Fever	1	2	....	1	1	5	....	...	1	....	....	1
33. Rheumatism	23	25	17	22	24	111	7	3	5	6	6	27
34. Scarlatina	11	8	8	8	11	46	....	....	8	....	5	13
35. Small Pox	....	....	....	....	....	.....	....	....	....	....	....	.....
36. Syphilis	8	10	15	8	11	52	1	3	4	2	5	15
37. Tonsillitis	15	21	15	12	22	85	6	9	4	7	9	35
38. Tubercular Disease (other than pulmonary)	....	3	1	2	2	8	1	....	....	....	....	1
39. Whooping Cough	9	16	2	2	19	48	3	5	....	3	....	11
Total No. of Diseases	505	538	409	375	515	2342	141	163	147	162	174	787
Number of Reporters for each week and month	15	14	13	11	14	67	5	5	6	6	6	28
	Average No. of Reporters for the five weeks of December, 13·40.						Average No. of Reporters for the five weeks of December, 5·60.					

October, 1882, ending September 30th, 1883—*Continued.*

District No. VIII.						District No. IX.						District No. X.					
Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.
Dec. 2nd.	Dec. 9th.	Dec. 16th.	Dec. 23rd.	Dec. 30th.		Dec. 2nd.	Dec. 9th.	Dec. 16th.	Dec. 23rd.	Dec. 30th.		Dec. 2nd.	Dec. 9th.	Dec. 16th.	Dec. 23rd.	Dec. 30th.	
1	1	...	...	1	3	1	...	...	2	2	5	3	6	3	4	2	18
3	...	1	1	2	7	1	1	5	3	3	13	9	12	9	11	17	58
6	2	1	1	3	13	2	1	1	1	2	7	6	9	8	7	7	37
1	...	...	...	...	1	3	1	...	...	...	4	...	1	...	1	1	3
2	...	...	...	1	3	1	...	1	...	3	5	2	1	6	3	2	14
...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	1
18	8	6	17	17	66	5	3	9	4	9	30	21	34	41	23	35	154
...	...	...	...	...	...	...	...	1	1	1	3	1	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	1	1	...	2	...	1	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	...	3	...	2	1	2	8
5	2	2	1	3	13	1	2	2	1	2	8	11	6	10	5	9	41
...	...	...	1	...	1	2	1	...	...	1	4	3	5	1	...	...	9
...	...	...	...	...	...	6	3	1	4	8	22	7	9	9	...	9	34
5	...	3	5	5	18	3	3	3	2	2	13	2	4	1	1	5	13
3	...	...	...	...	3	...	...	2	...	1	3	1	5	...	...	...	6
...	...	1	1	1	3	1	2	2	2	2	9	1	2	4	3	2	12
6	3	8	9	7	33	1	1	1	1	1	5	35	30	27	25	27	144
...	...	...	...	...	...	...	...	2	2	2	6	4	3	3	...	1	11
...	...	...	...	...	...	1	1	...	...	...	2	2	...	1	...	1	4
2	1	1	1	...	5	1	1	...	...	2	4	2	2	1	1	1	7
5	...	1	...	1	7	...	...	...	...	1	1	3	2	3	...	1	9
4	...	...	...	1	5	1	...	2	4	1	8	3	5	2	3	4	17
...	...	8	1	8	17	3	1	3	1	2	10	11	5	9	9	7	41
...	...	...	...	...	...	1	...	2	1	1	5	1	...	...	1	...	2
...	...	...	...	...	...	3	...	6	7	25	41	...	...	...	...	...	...
6	...	...	...	1	7	6	4	...	1	...	11	...	1	...	...	1	2
12	6	9	15	15	57	4	5	15	3	4	31	7	14	13	14	19	67
...	...	...	...	1	1	2	2	1	...	...	5	1	2	1	5	1	10
6	1	...	4	4	15	3	4	2	...	1	10	6	6	6	1	6	25
2	1	...	...	1	4	1	2	...	1	1	5	2	3	6	4	3	18
1	...	...	...	1	2	1	...	...	...	...	1	...	...	...	...	...	...
3	...	...	3	5	11	...	2	2	5	3	12	5	9	9	8	6	37
2	1	...	...	1	4	6	6	9	2	1	24	...	1	1	...	2	4
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	1	1	1	5	...	...	1	...	1	2	2	3	3	...	...	8
3	2	3	3	4	15	2	2	6	9	8	27	6	21	17	8	8	60
2	...	...	...	...	2	...	1	1	1	...	3	...	...	...	...	...	...
...	...	...	...	...	...	...	...	1	...	...	1	1	3	2	2	1	9
100	28	45	64	84	321	62	49	82	59	90	342	161	205	199	140	180	885
5	3	3	4	5	20	4	4	5	4	4	21	8	8	8	5	7	36
Average No. of Reporters for the five weeks of December, 4·00.						Average No. of Reporters for the five weeks of December, 4·20.						Average No. of Reporters for the five weeks of December, 7·20.					

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. I.					District No. II.				
	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
	Jan. 6th.	Jan. 13th.	Jan. 20th.	Jan. 27th.		Jan. 6th.	Jan. 13th.	Jan. 20th.	Jan. 27th.	
1. Asthma (Spasmodic)	3	1	2	2	8	2	4	3	4	13
2. Anæmia	7	....	5	6	18	21	17	13	12	63
3. Accidents (Railroad, Machinery, etc.)	1	....	5	1	7	11	6	1	2	20
4. Blood Poisoning	....	....	..	....	.....	..	....	....	....	.....
5. Bright's Disease	1	1	....	....	2	....	....	....	2	2
6. Brain, Inflammation of	1	....	1	1	3	....	1	....	....	1
7. Bronchitis	17	12	17	21	67	33	33	29	23	118
8. Calculus	....	..	....	....	....	....	1	....	....	1
9. Cerebro-Spinal Meningitis	....	..	....	...	....	....	2	....	....	2
10. Cholera Infantum	....	....	....	...	.....	1	....	....	....	1
11. Cholera Morbus	....	....	....	...	.....	....	....	....	....	.....
12. Consumption, Pulmonary	6	3	4	6	19	12	9	9	14	44
13. Croup, Membranous	2	1	....	1	4	2	1	2	2	7
14. Diphtheria	3	....	....	2	5	5	19	3	4	31
15. Diarrhœa	9	....	4	1	14	9	12	5	7	33
16. Dysentery	1	....	....	1	2	....	....	....	....	.....
17. Erpsipelas	2	....	1	1	4	6	6	5	3	20
18. Fever, Intermittent	....	....	....	....	.....	5	10	4	4	23
19. Fever, Enteric	1	....	....	....	1	1	3	5	2	11
20. Fever, Typho-Malarial	...	....	....	...	....	4	....	....	....	4
21. Goitre	1	....	....	1	2	3	2	1	2	8
22. Gonorrhœa	2	2	4	5	13	3	2	....	1	6
23. Heart Disease, Organic	5	....	3	4	12	4	2	3	2	11
24. Influenza	8	8	9	7	32	17	26	4	17	64
25. Insanity	....	....	....	1	1	....	2	....	1	3
26. Measles	....	2	....	1	3	....	....	....	....	.....
27. Mumps	4	....	5	6	15	14	13	11	8	46
28. Neuralgia	9	5	8	10	32	10	10	12	18	50
29. Peritonitis (non-puerperal)	...	1	....	....	1	....	....	5	4	9
30. Pneumonia	3	1	4	5	13	8	9	10	8	35
31. Pleurisy	....	1	2	1	4	1	2	2	3	8
32. Puerperal Fever	....	....	1	....	1	....	1	1	2	4
33. Rheumatism	3	....	9	4	16	8	9	7	10	34
34. Scarlatina	3	1	4	3	11	4	2	2	1	9
35. Small Pox	...	..	....	..	.....	....	....	....	....	.....
36. Syphilis	3	....	2	1	6	....	....	1	2	3
37. Tonsillitis	9	7	7	6	29	22	11	9	7	49
38. Tubercular Disease (other than pulmonary)	2	....	2	1	5	1	....	1	1	3
39. Whooping Cough	5	2	2	1	10	8	12	6	19	45
Total No. of Diseases	111	48	101	100	360	215	227	154	185	781
Number of Reporters for each week and month	5	3	5	5	18	10	10	7	8	35
	Average No. of Reporters for the four weeks of January, 4·50.					Average No. of Reporters for the four weeks of January, 8·75.				

October, 1882, ending September 30th, 1883—*Continued.*

District No. III.					District No. IV.					District No. V.				
Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
Jan. 6th.	Jan. 10th.	Jan. 20th.	Jan. 27th.		Jan. 6th.	Jan. 13th.	Jan. 20th.	Jan. 27th.		Jan. 6th.	Jan. 13th.	Jan. 20th.	Jan. 27th.	
......	3	......	......	3	8	17	21	10	56	2	3	1	2	8
2	1	......	3	6	38	31	49	50	168	6	11	10	9	36
......	2	......	......	2	14	25	28	25	92	11	6	6	4	27
......	......	......	......	......	4	20	2	5	31	2	......	1	1	4
......	......	1	......	1	9	9	16	17	51	2	2	2	1	7
......	......	1	......	1	8	2	10	2	22	......	......	......	......	......
7	......	5	7	19	67	91	134	108	400	22	18	16	19	75
......	......	......	......	......	6	2	7	5	20	......	......	......	......	......
......	......	......	......	......	......	1	1	2	4	......	1	......	......	1
......	......	......	......	......	1	......	2	1	4	......	......	......	......	......
......	......	......	......	......	......	1	6	......	7	......	......	......	......	......
......	......	......	......	......	29	20	34	32	115	12	10	5	4	31
......	......	......	......	......	5	3	2	7	17	1	......	1	2	4
4	3	1	1	9	26	21	19	14	80	......	1	......	1	2
10	1	6	15	32	34	26	28	34	122	1	3	3	5	12
......	2	......	......	2	6	2	3	4	15	......	......	......	......	......
3	......	1	3	7	10	11	17	12	50	2	3	1	2	8
4	......	1	......	5	19	12	11	14	56	4	3	3	2	12
3	1	1	3	8	5	7	4	8	24	3	......	1	......	4
......	2	......	......	2	5	......	4	4	13	......	......	......	......	......
4	1	4	4	13	13	15	17	16	61	68	4	4	5	81
1	1	4	......	6	8	17	16	9	50	4	1	1	1	7
2	......	3	3	8	24	25	25	20	94	......	......	1	2	3
48	4	12	26	90	68	71	98	65	302	12	4	4	12	32
......	......	......	......	......	6	1	2	......	9	2	5	2	2	11
6	5	......	2	13	3	11	30	17	61	1	1	1	1	4
......	......	......	......	......	3	15	4	18	40	4	2	5	9	20
6	2	5	10	23	48	50	50	53	201	9	7	12	12	40
......	......	......	......	......	7	6	3	5	21	2	1	1	......	4
7	2	1	1	11	34	29	38	28	129	5	4	......	2	11
3	1	......	1	5	34	28	24	16	102	3	3	2	2	10
......	......	......	......	......	1	4	2	7	14	2	2	2	1	7
9	1	4	4	18	41	43	63	40	187	5	4	6	8	23
......	......	......	......	......	13	13	12	11	49	9	17	14	16	56
1	......	8	12	21	......	......	......	......	......	......	......	......	......	......
3	......	3	2	8	15	17	29	11	72	5	5	5	5	20
8	1	1	4	14	19	27	29	24	99	10	6	7	3	26
......	......	......	......	......	3	6	8	4	21	1	1	1	1	4
......	......	......	......	......	1	11	1	16	29	......	......	......	1	1
131	33	62	101	327	635	690	849	714	2888	210	128	118	135	591
3	2	2	3	10	18	18	19	19	74	5	4	4	4	17
Average No. of Reporters for the four weeks of January, 2·50.					Average No. of Reporters for the four weeks of January, 18·50.					Average No. of Reporters for the four weeks of January, 4·25.				

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. VI. Number of Cases for week ending Jan. 6th.	Jan. 13th.	Jan. 20th.	Jan. 27th.	Total Cases for Month.	District No. VII. Number of Cases for week ending Jan. 6th.	Jan. 13th.	Jan. 20th.	Jan. 27th.	Total Cases for Month.
1. Asthma (Spasmodic)	11	5	7	7	30	3	....	11	2	16
2. Anæmia	35	19	46	37	137	1	....	13	14	28
3. Accidents (Railroad, Machinery, etc.)	18	19	30	24	91	3	2	5	2	12
4. Blood Poisoning	4	1	8	2	15	1	....	1	....	2
5. Bright's Disease	10	5	9	8	32	1	1	3	3	8
6. Brain, Inflammation of	....	....	2	2	4	....	....	....	....	....
7. Bronchitis	86	61	91	85	323	36	16	61	53	166
8. Calculus	5	...	3	5	13	....	....	1	....	1
9. Cerebro-Spinal Meningitis	1	2	....	1	4	2	2	2	2	8
10. Cholera Infantum	2	1	2	6	11	....	....	....	....	....
11. Cholera Morbus	....	....	4	6	10	....	....	....	....	....
12. Consumption, Pulmonary	23	18	19	22	82	17	1	20	12	50
13. Croup, Membranous	2	1	3	7	13	....	....	13	....	13
14. Diphtheria	27	15	21	25	88	2	5	3	....	10
15. Diarrhœa	8	2	15	16	41	7	2	6	4	19
16. Dysentery	....	5	4	5	14	....	....	1	....	1
17. Erysipelas	9	10	11	7	37	3	...	10	3	16
18. Fever, Intermittent	14	5	13	6	38	9	3	8	15	35
19. Fever, Enteric	2	5	4	4	15	....	....	....	....	....
20. Fever, Typho-Malarial	1	3	....	....	4	2	....	....	....	2
21. Goitre	5	11	9	8	33	3	....	4	4	11
22. Gonorrhœa	14	8	12	14	48	5	1	10	2	18
23. Heart Disease, Organic	18	7	16	16	57	9	1	14	9	33
24. Influenza	42	45	40	49	176	15	1	23	7	46
25. Insanity	4	4	6	2	16	1	....	1	1	3
26. Measles	3	5	4	23	35	....	1	1	9	11
27. Mumps	12	6	12	17	47	....	....	3	4	7
28. Neuralgia	39	29	41	42	151	19	5	30	24	78
29. Peritonitis (non-puerperal)	9	4	13	6	32	3	1	1	1	6
30. Pneumonia	25	17	20	20	82	10	4	8	9	31
31. Pleurisy	11	7	12	6	36	1	....	4	2	7
32. Puerperal Fever	....	....	3	2	5	....	....	....	....	....
33. Rheumatism	16	21	23	27	87	9	5	15	17	46
34. Scarlatina	7	2	6	2	17	9	....	6	....	15
35. Small Pox	....	....	...	...	....	....	....	6	....	6
36. Syphilis	13	3	9	14	39	5	1	7	4	17
37. Tonsillitis	25	19	29	22	95	17	2	9	11	39
38. Tubercular Disease (other than pulmonary)	2	1	1	4	8	1	....	3	1	5
39. Whooping Cough	28	7	17	13	65	....	....	5	7	12
Total No. of Diseases	531	373	565	562	2031	194	54	308	222	778
Number of Reporters for each week and month	16	13	16	15	60	6	4	6	5	21
	Average No. of Reporters for the four weeks of January, 15·00.					Average No. of Reporters for the four weeks of January, 5·25.				

October, 1882, ending September 30th, 1883—*Continued.*

District No. VIII.					District No. IX.					District No. X.				
Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
Jan. 6th.	Jan. 13th.	Jan. 20th.	Jan. 27th.		Jan. 6th.	Jan. 13th.	Jan. 20th.	Jan. 27th.		Jan. 6th.	Jan. 13th.	Jan. 20th.	Jan. 27th.	
1	2	2	1	6	......	......	1	1	2	2	2	5	4	13
4	5	4	9	22	4	6	4	3	17	13	12	11	12	48
3	5	4	4	16	1	1	2	4	8	10	8	5	10	33
1	......	......	......	1	......	......	......	......	......	4	3	1	3	11
1	......	3	2	6	2	3	2	4	11	3	2	2	1	8
......	......	......	......	......	......	1	......	2	3	......	......	1	......	1
16	17	37	50	120	3	6	7	9	25	34	39	55	28	156
1	......	......	......	1	2	......	1	1	4	......	......	1	......	1
......	......	......	......	......	......	......	......	......	......	......	2	......	......	2
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	......	......	......	3	1	1	5
1	2	2	2	7	2	2	13	3	20	9	7	12	10	38
......	......	......	......	......	......	......	......	1	1	......	......	......	1	1
......	......	1	1	2	1	1	3	1	6	6	6	3	5	20
4	2	4	7	17	4	2	1	1	8	2	4	7	10	23
......	......	1	1	2	1	1	1	......	3	2	......	......	......	2
1	......	2	......	3	1	2	1	......	4	3	......	7	1	11
12	14	25	15	66	1	2	......	1	4	34	29	36	20	119
......	......	......	1	1	2	2	1	1	6	1	2	4	4	11
......	......	1	......	1	......	1	......	......	1	1	1	1	......	3
......	......	2	4	6	1	1	......	2	4	1	1	......	3	5
1	......	1	3	5	......	......	1	......	1	2	2	2	7	13
2	......	3	3	8	1	3	3	4	11	6	7	9	8	30
19	12	11	11	53	3	5	3	5	16	4	7	8	9	28
1	......	......	......	1	......	......	1	......	1	1	......	......	......	1
......	1	1	......	2	33	30	25	15	103	......	......	2	5	7
......	2	1	1	4	......	......	2	5	7	3	......	2	5	10
10	11	11	15	47	5	5	6	6	22	19	17	18	12	66
......	3	4	......	7	......	......	......	......	......	......	2	1	......	3
3	3	8	9	23	3	5	13	1	22	1	3	6	7	17
......	......	1	......	1	2	1	3	1	7	1	4	4	......	9
......	......	......	......	......	......	1	......	1	2	2	......	4	......	6
3	8	10	6	27	5	6	14	7	32	10	11	7	6	34
4	5	3	1	13	2	......	1	......	3	6	9	5	6	26
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
2	......	1	1	4	......	......	......	......	......	3	2	2	6	13
7	7	4	6	24	7	4	11	17	39	8	8	10	11	37
......	......	......	1	1	......	......	......	......	......	......	......	......	1	1
......	......	7	6	13	......	......	......	......	......	......	1	1	......	2
97	99	154	160	510	86	91	120	96	393	191	194	233	196	814
5	5	6	6	22	4	4	5	5	18	7	7	8	9	31
Average No. of Reporters for the four weeks of January, 5·50.					Average No. of Reporters for the four weeks of January, 4·50.					Average No. of Reporters for the four weeks of January, 7·75.				

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. I. — Number of Cases for week ending Feb. 3rd.	Feb. 10th.	Feb. 17th.	Feb. 24th.	Total Cases for Month.
1. Asthma (Spasmodic)	....	3	1	3	7
2. Anæmia	5	4	7	4	20
3. Accidents (Railroad, Machinery, etc.)	1	1	....	3	5
4. Blood Poisoning	2	2	1	...	5
5. Bright's Disease	....	....	1	...	1
6. Brain, Inflammation of	....	....	2	3	5
7. Bronchitis	18	25	24	22	89
8. Calculus	....	....	....	....	.....
9. Cerebro-Spinal Meningitis	....	....	....	....	.....
10. Cholera Infantum	....	....	....	....	.....
11. Cholera Morbus	....	....	1	2	3
12. Consumption, Pulmonary	6	6	6	4	22
13. Croup, Membranous	....	....	....	....	.....
14. Diphtheria	3	....	1	....	4
15. Diarrhœa	....	8	2	1	11
16. Dysentery	....	1	....	....	1
17. Erysipelas	....	2	1	1	4
18. Fever, Intermittent	....	....	....	....	.....
19. Fever, Enteric	....	....	....	....	.....
20. Fever, Typho-Malarial	....	....	....	....	.....
21. Goitre	....	1	....	....	1
22. Gonorrhœa	2	1	2	1	6
23. Heart Disease, Organic	2	3	2	4	11
24. Influenza	13	9	8	8	38
25. Insanity	....	....	....	....	.....
26. Measles	....	....	....	....	.....
27. Mumps	2	5	2	4	13
28. Neuralgia	10	6	3	4	23
29. Peritonitis (non-puerperal)	....	....	....	....	.....
30. Pneumonia	4	....	....	2	6
31. Pleurisy	....	1	1	1	3
32. Puerperal Fever	....	....	1	1	2
33. Rheumatism	4	3	4	5	16
34. Scarlatina	....	....	....	....	.....
35. Small Pox	....	....	....	....	.....
36. Syphilis	....	1	1	2	4
37. Tonsillitis	5	5	1	7	18
38. Tubercular Disease (other than pulmonary)	1	1	....	1	3
39. Whooping Cough	....	3	....	2	5
Total No. of Diseases	78	91	72	85	326
Number of Reporters for each week and month	4	4	4	4	16

Average No. of Reporters for the four weeks of February, 4·00.

DISEASES.	District No. II. — Number of Cases for week ending Feb. 3rd.	Feb. 10th.	Feb. 17th.	Feb. 24th.	Total Cases for Month.
1. Asthma (Spasmodic)	3	1	....	2	6
2. Anæmia	21	28	19	22	90
3. Accidents (Railroad, Machinery, etc.)	5	4	2	2	13
4. Blood Poisoning	1	....	....	....	1
5. Bright's Disease	2	4	5	1	12
6. Brain, Inflammation of	1	....	....	....	1
7. Bronchitis	29	37	41	23	130
8. Calculus	....	1	2	6	9
9. Cerebro-Spinal Meningitis	....	....	....	....	.....
10. Cholera Infantum	1	....	....	....	1
11. Cholera Morbus	....	....	....	....	.....
12. Consumption, Pulmonary	16	13	10	10	49
13. Croup, Membranous	1	2	1	1	5
14. Diphtheria	10	23	18	4	55
15. Diarrhœa	6	5	4	10	25
16. Dysentery	....	....	1	1	2
17. Erysipelas	3	1	2	7	13
18. Fever, Intermittent	5	3	9	6	23
19. Fever, Enteric	2	5	5	2	14
20. Fever, Typho-Malarial	....	....	....	....	.....
21. Goitre	8	7	9	7	31
22. Gonorrhœa	1	2	....	....	3
23. Heart Disease, Organic	3	4	3	1	11
24. Influenza	8	15	22	15	60
25. Insanity	1	1	2	4	8
26. Measles	11	9	13	15	48
27. Mumps	11	25	25	18	79
28. Neuralgia	20	19	23	17	79
29. Peritonitis (non-puerperal)	....	2	3	1	6
30. Pneumonia	8	11	17	14	50
31. Pleurisy	5	3	4	4	16
32. Puerperal Fever	1	1	....	2	4
33. Rheumatism	12	12	16	18	58
34. Scarlatina	....	14	16	12	42
35. Small Pox	....	....	....	....	.....
36. Syphilis	1	....	....	2	3
37. Tonsillitis	15	16	19	11	61
38. Tubercular Disease (other than pulmonary)	....	....	....	1	1
39. Whooping Cough	19	14	8	11	52
Total No. of Diseases	230	282	299	250	1061
Number of Reporters for each week and month	9	10	9	8	36

Average No. of Reporters for the four weeks of February, 9·00.

October, 1882, ending September 30th, 1883.—*Continued.*

District No. III.					District No. IV.					District No. V.				
Number of Cases fo week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
Feb. 3rd.	Feb. 10th.	Feb. 17th.	Feb. 24th.		Feb. 3rd.	Feb. 10th.	Feb. 17th.	Feb. 24th.		Feb. 3rd.	Feb. 10th.	Feb. 17th.	Feb. 24th.	
.....	.....	.....	.....	.....	16	9	14	14	53	1	1	1	1	4
2	.....	.....	.....	2	49	41	27	41	158	9	11	14	3	37
.....	.....	.....	.....	.....	24	39	23	22	108	9	5	3	1	18
.....	.....	.....	.....	.....	10	1	5	3	17	.....	1	.....	.....	1
.....	.....	.....	.....	.....	13	8	6	4	31	1	2	2	.....	5
1	.....	6	.....	7	10	3	2	3	18	.....	1	.....	.....	1
7	3	.....	.....	20	124	116	89	105	434	13	25	19	7	64
.....	.....	.....	.....	.....	7	4	4	4	19	.....	.....	.....	.....	.....
.....	.....	1	.....	1	1	...	1	1	3	.....	...	.....	.....	.....
.....	.....	.....	.....	.....	.....	1	2	.....	3	.....	.....	....	.....	.....
.....	.....	.....	.....	.....	.....	1	1	1	3	.....	.....	....	.....	.....
.....	.....	.....	.....	.....	26	29	32	33	120	4	7	4	.....	15
.....	.....	.....	.....	.....	8	8	3	7	26	1	.....	.....	.....	1
3	2	.....	.....	5	26	3	11	17	57	5	9	4	1	19
.....	....	.....	.....	.....	51	64	49	43	207	1	4	1	2	8
.....	.....	....	.....	.....	4	6	2	2	14	....	.....	.....	.....	.....
.....	.....	.....	.....	.....	17	11	10	15	53	4	4	2	1	11
.....	.....	.....	....	.....	8	18	16	12	54	2	1	.....	.....	3
3	.....	.....	.....	3	11	12	9	11	43	.....	.....	.....	.....	.....
.....	....	.....	.....	.....	3	6	6	4	19	.....	.....	.....	.....	.....
3	.....	.....	.....	3	12	11	4	5	32	5	4	5	2	16
3	.....	.....	..	3	15	5	6	10	36	1	.....	.....	1	2
.....	.....	.....	.....	.....	25	29	23	20	97	2	3	1	1	7
9	.....	4	.....	13	115	70	48	91	324	5	13	17	4	39
.....	.....	.....	.....	.....	4	4	1	1	10	2	3	3	.....	8
6	20	20	.....	46	10	56	20	29	115	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	25	17	13	1	56	2	4	7	3	16
4	2	....	.....	6	61	50	49	50	210	12	22	11	5	50
1	.....	.....	.....	1	6	10	3	1	20	.....	2	2	2	6
.....	2	2	.....	4	47	25	31	28	131	3	12	7	3	25
1	1	2	.....	4	32	6	10	11	59	1	4	8	1	14
.....	.....	.....	.....	.....	7	3	4	2	16	.....	.....	.....	2	2
2	2	2	.....	6	66	42	30	43	181	7	4	6	6	23
.....	.....	2	.....	2	13	7	8	9	37	18	16	13	3	50
.....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	23	9	15	17	64	5	5	5	.....	15
9	2	.....	.....	11	22	23	25	20	90	2	3	8	4	17
.....	.....	.....	.....	.....	8	4	6	3	21	1	.....	1	.....	2
.....	.....	.....	.....	.....	4	7	10	19	40	1	1	....	....	2
54	34	39	.....	127	903	758	616	703	2980	117	167	144	53	481
2	1	1	.....	4	21	19	17	18	75	4	5	4	3	16
Average No. of Reporters for the our weeks of February, 1·00.					Average No. of Reporters for the four weeks of February, 18·75.					Average No. of Reporters for the four weeks of February, 4·00.				

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. VI. Number of Cases for week ending Feb. 3rd.	Feb. 10th.	Feb. 17th.	Feb. 24th.	Total Cases for Month.	District No. VII. Number of Cases for week ending Feb. 3rd.	Feb. 10th.	Feb. 17th.	Feb. 24th.	Total Cases for Month.
1. Asthma (Spasmodic)	6	8	6	10	30	2	2	2	2	8
2. Anæmia	54	49	50	57	210	9	8	13	18	48
3. Accidents (Railroad, Machinery, etc.)	36	22	18	21	97	4	5	3	6	18
4. Blood Poisoning	1	1	1	4	7	....	....	....	....	.....
5. Bright's Disease	13	6	9	10	38	1	2	2	2	7
6. Brain, Inflammation of	7	1	1	2	11	....	....	....	....	.....
7. Bronchitis	96	79	68	80	323	62	62	68	61	253
8. Calculus	6	....	....	2	8	...	...	....	1	1
9. Cerebro-Spinal Meningitis	....	...	...	....	....	3	3	1	1	8
10. Cholera Infantum	8	....	7	1	16	....	....	....	....	.....
11. Cholera Morbus	4	....	....	1	5	....	....	....	....	.....
12. Consumption, Pulmonary	19	19	18	20	76	11	10	10	13	44
13. Croup, Membranous	1	2	5	2	10	2	1	2	1	6
14. Diphtheria	21	22	21	12	76	....	1	1	....	2
15. Diarrhœa	17	14	20	16	67	8	9	10	11	38
16. Dysentery	4	1	3	2	10	....	....	....	....	.....
17. Erysipelas	13	10	10	1	34	1	3	5	6	15
18. Fever, Intermittent	13	19	18	25	75	15	7	16	29	67
19. Fever, Enteric	13	7	4	1	25	...	....	....	....	.....
20. Fever, Typho-Malarial	2	4	4	5	15	....	1	2	4	7
21. Goitre	15	8	5	10	38	6	5	7	3	21
22. Gonorrhœa	14	11	12	5	42	2	....	1	....	3
23. Heart Disease, Organic	33	13	11	13	70	8	11	10	6	35
24. Influenza	45	51	28	68	192	14	18	18	19	69
25. Insanity	2	2	2	3	9	....	....	....	....	....
26. Measles	11	7	5	6	29	4	9	2	2	17
27. Mumps	20	20	21	2	63	3	....	....	....	3
28. Neuralgia	52	34	35	38	159	22	21	21	24	88
29. Peritonitis (non-puerperal)	10	5	5	4	24	....	4	1	2	7
30. Pneumonia	36	27	21	21	105	7	11	9	10	37
31. Pleurisy	17	9	8	8	42	3	2	3	4	12
32. Puerperal Fever	3	2	1	....	6	....	....	....	....	.....
33. Rheumatism	21	23	20	12	76	15	12	13	12	52
34. Scarlatina	20	13	16	21	70	....	....	....	1	1
35. Small Pox	..	....	....	....	....	....	....	....	...	.....
36. Syphilis	13	12	6	5	36	4	5	4	3	16
37. Tonsillitis	29	18	20	17	84	12	18	12	13	55
38. Tubercular Diseases (other than pulmonary)	6	2	4	....	12	1	1	1	1	4
39. Whooping Cough	17	17	8	13	55	8	11	11	8	38
Total No. of Diseases	698	538	491	518	2245	227	242	248	263	980
Number of Reporters for each week and month	18	15	13	14	60	5	5	6	6	22
	Average No. of Reporters for the four weeks of February, 15·00.					Average No. of Reporters for the four weeks of February, 5·50.				

October, 1882, ending September 30, 1883—*Continued.*

District No. VIII.					District No. IX.					District No. X.				
Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
Feb. 3rd.	Feb. 10th.	Feb. 17th.	Feb. 24th.		Feb. 3rd.	Feb. 10th.	Feb. 17th.	Feb. 24th.		Feb. 3rd.	Feb. 10th.	Feb. 17th.	Feb. 24th.	
1	1	1	6	9	2	2	.....	1	5	1	2	2	3	8
6	13	2	7	28	4	3	3	2	12	13	16	16	23	68
3	5	4	4	16	2	2	1	1	6	7	11	4	14	36
.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	2	2	1	5
1	1	.....	3	5	3	.....	.....	1	4	1	1	5	7	14
.....	1	2	.....	3	.....	.....	.....	.....	.....	.....	1	1	.....	2
29	34	36	37	136	8	9	7	5	29	31	38	42	41	152
.....	.....	.....	.....	.....	2	.....	1	.....	3	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	1	.....	.....	1	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6	5	2	6	19	2	3	.....	.....	5	6	11	12	12	41
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	1	3
1	2	2	3	8	2	1	1	1	5	7	6	5	16	34
7	4	10	9	30	1	1	1	.....	3	2	2	3	4	11
.....	.....	1	.....	1	1	.....	.....	.....	1	1	.....	1	1	3
.....	2	1	2	5	1	5	4	1	11	4	3	1	3	11
15	21	20	26	82	1	1	.....	1	3	12	24	36	37	109
1	.....	.....	.....	1	1	.....	.....	.....	1	3	5	4	1	13
2	2	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	1	1	2
3	2	.....	5	10	2	.....	1	1	4	.....	.....	2	1	3
2	4	6	8	20	.....	.....	.....	.....	.....	6	2	5	4	17
4	3	1	6	14	5	2	1	1	9	3	5	7	4	19
6	25	18	25	74	1	1	4	.....	6	5	11	2	7	25
.....	.....	.....	1	1	.....	.....	.....	.....	.....	2	1	1	4	8
.....	.....	.....	.....	.....	15	6	4	.....	25	.....	5	11	15	31
1	2	.....	5	8	1	2	.....	1	4	3	3	11	5	22
20	23	13	24	80	4	6	10	3	23	12	15	17	9	53
.....	1	.....	1	2	2	.....	.....	.....	2	2	3	2	1	8
4	8	4	3	19	3	4	4	1	12	1	3	7	1	12
2	1	.....	3	6	1	.....	1	.....	2	2	4	1	4	11
.....	.....	1	3	4	.....	.....	.....	.....	.....	.....	4	.....	1	5
4	7	2	10	23	8	6	6	2	22	2	8	6	6	22
.....	.....	10	7	17	2	2	2	.....	6	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	1	1	4	6	1	.....	.....	.....	1	1	1	5	5	12
5	7	6	10	28	7	5	4	1	17	11	10	13	15	49
1	1	1	2	5	1	1	1	.....	3	.....	.....	1	.....	1
.....	.....	4	3	7	1	.....	.....	.....	1	1	2	.....	2	5
124	176	149	223	672	84	63	56	24	227	139	199	228	249	815
4	6	6	8	24	5	4	4	2	15	7	7	8	8	30

Average No. of Reporters for the four weeks of February, 6·00.	Average No. of Reporters for the four weeks of February, 3·75.	Average No. of Reporters for the four weeks of February, 7·50.

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. I. Number of Cases for week ending					District No. I.	District No. II. Number of Cases for week ending					District No. II.
	Mar. 3rd.	Mar. 10th.	Mar. 17th.	Mar. 24th.	Mar. 31st.	Total Cases for Month.	Mar. 3rd.	Mar. 10th.	Mar. 17th.	Mar. 24th.	Mar. 31st.	Total Cases for Month.
1. Asthma (Spasmodic)	3	1	....	....	1	5	3	4	2	3	1	13
2. Anæmia	4	2	7	7	7	27	12	18	21	18	30	99
3. Accidents (Railroad, Machinery, etc.)	2	....	4	3	....	9	6	13	4	....	5	28
4. Blood Poisoning	....	1	1	....	....	2	....	1	1	....	1	3
5. Bright's Disease	1	1	1	....	1	4	2	2	4	1	1	10
6. Brain, Inflammation of	....	....	....	1	....	1	....	....	....	....	....	.....
7. Bronchitis	12	15	16	17	21	81	25	26	37	44	26	158
8. Calculus	....	....	....	....	....	.....	5	1	1	1	....	8
9. Cerebro-Spinal Meningitis	....	....	....	....	....	.....	....	....	....	....	....	.....
10. Cholera Infantum	....	....	....	....	....	.....	....	1	....	....	1	2
11. Cholera Morbus	5	....	....	....	....	5	....	....	....	....	....	.....
12. Consumption, Pulmonary	3	4	5	3	5	20	8	8	8	10	8	42
13. Croup, Membranous	....	....	....	1	1	2	....	....	2	....	....	2
14. Diphtheria	....	....	....	....	....	.....	4	6	10	2	....	22
15. Diarrhœa	2	2	2	4	4	14	9	6	6	10	5	36
16. Dysentery	....	....	....	....	....	.....	2	2	..	....	1	5
17. Erysipelas	....	....	1	1	1	3	4	5	3	5	3	20
18. Fever, Intermittent	....	....	....	....	3	3	5	9	2	6	7	29
19. Fever, Enteric	....	1	1	1	....	3	2	3	....	2	2	9
20. Fever, Typho-Malarial	....	....	....	....	....	.....	3	....	....	3	....	6
21. Goitre	....	....	....	2	2	4	5	8	10	7	3	33
22. Gonorrhœa	2	....	3	2	1	8	....	....	....	1	1	2
23. Heart Disease, Organic	3	....	3	2	4	12	2	1	2	3	3	11
24. Influenza	11	6	24	22	22	85	17	12	37	26	27	119
25. Insanity	....	1	1	1	1	4	4	1	2	....	....	7
26. Measles	1	....	....	....	....	1	11	....	9	7	8	35
27. Mumps	4	5	3	9	6	27	20	15	18	13	7	73
28. Neuralgia	3	4	8	10	13	38	10	8	20	19	22	79
29. Peritonitis (non-puerperal)	....	....	....	....	....	.....	....	4	1	2	1	8
30. Pneumonia	5	2	2	....	1	10	5	7	6	1	3	22
31. Pleurisy	1	....	1	2	4	8	1	3	3	6	2	15
32. Puerperal Fever	2	1	....	....	1	4	....	3	1	1	1	6
33. Rheumatism	7	2	3	3	6	21	16	14	9	12	10	61
34. Scarlatina	1	1	....	....	2	4	9	....	1	2	1	13
35. Small Pox	....	....	....	....	....	.....	....	....	....	....	....	.....
36. Syphilis	....	....	....	....	1	1	....	1	....	5	1	7
37. Tonsillitis	6	7	2	1	5	21	15	11	14	8	11	59
38. Tubercular Disease (other than pulmonary	1	....	....	....	1	2	1	1	2	2	....	6
39. Whooping Cough	3	3	1	5	4	16	12	2	2	4	5	25
Total No. of Diseases	82	59	89	97	118	445	218	196	238	224	197	1073
Number of Reporters for each week and month	5	3	4	4	5	21	8	7	9	8	7	39
	Average No. of Reporters for the five weeks of March, 4·20.						Average No. of Reporters for the five weeks of March, 7·80.					

October 1882, ending September 30th, 1883—*Continued.*

District No. III.						District No. IV.						District No. V.					
Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.
Mar. 3rd.	Mar. 10th.	Mar. 17th.	Mar. 24th.	Mar. 31st.		Mar. 3rd.	Mar. 10th.	Mar. 17th.	Mar. 24th.	Mar. 31st.		Mar. 3rd.	Mar. 10th.	Mar. 17th.	Mar. 24th.	Mar. 31st.	
1	1	....	....	3	5	12	19	10	14	10	65	....	....	1	1	1	3
2	....	2	....	2	6	52	45	46	39	35	217	10	11	11	10	7	49
1	....	2	1	....	4	26	19	14	22	18	99	7	7	8	5	7	34
....	....	....	....	....	....	7	2	6	5	9	29	....	....	....	....	....	....
1	....	1	....	1	3	13	13	9	6	5	46	4	3	4	5	3	19
....	....	2	....	....	2	4	11	2	3	2	22	....	....	1	....	1	2
6	5	11	20	6	48	122	147	93	119	116	597	18	14	25	13	15	85
....	....	....	....	....	....	6	....	2	1	2	11	....	....	....	....	....	....
....	....	1	....	2	3	2	2	....	1	2	7	....	....	....	....	....	....
....	....	....	....	....	....	....	1	1	1	1	4	....	....	....	....	....	....
....	....	....	....	....	....	....	1	....	....	....	1	....	....	....	....	....	....
2	....	2	....	....	4	31	34	19	34	24	142	4	4	6	5	5	24
2	1	....	....	....	3	....	7	2	3	2	14	....	1	3	....	1	5
....	....	1	1	....	2	11	12	4	11	3	41	5	1	5	1	5	17
....	....	....	....	....	....	53	74	62	56	43	288	3	2	3	1	2	11
2	....	1	1	..	4	5	13	6	8	5	37	....	....	....	....	....	....
....	....	....	....	....	....	12	23	14	20	14	83	3	1	2	2	2	10
....	....	....	....	....	....	18	18	20	22	17	95	....	....	....	....	1	1
3	1	1	1	....	6	16	7	1	8	6	38	....	....	....	1	1	2
....	....	....	....	1	1	2	8	2	5	1	18	....	....	....	....	....	....
....	....	4	5	....	9	13	4	8	5	11	41	7	9	9	8	7	40
1	2	1	....	....	4	6	5	5	6	5	27	....	....	....	....	2	2
1	....	....	....	....	1	31	21	18	23	22	115	1	....	1	1	1	4
10	8	40	50	6	114	135	127	87	106	71	526	13	5	50	12	10	90
....	....	1	1	....	2	3	3	2	5	3	16	....	1	2	....	....	3
18	....	20	....	10	48	73	83	131	142	140	569	2	1	1	15	14	33
....	....	....	....	....	....	11	4	2	3	5	25	2	3	4	2	7	18
2	2	1	4	1	10	66	61	45	54	44	270	11	11	14	19	13	68
....	....	....	....	....	....	5	5	2	7	5	24	1	....	1	1	1	4
4	1	4	1	....	10	50	35	27	29	32	173	2	2	6	6	7	23
2	1	5	1	2	11	13	10	10	4	16	53	1	3	4	4	4	16
....	....	....	....	....	....	6	3	1	2	2	14	2	1	....	....	....	3
1	....	1	1	....	3	48	34	30	43	45	200	4	4	7	4	2	21
....	....	....	....	....	....	8	7	6	3	4	28	3	2	3	1	2	11
....	....	....	....	....	....	1	....	....	....	4	5	....	....	....	....	....	....
1	1	1	....	....	3	13	10	6	16	10	55	5	5	5	5	5	25
2	2	1	....	....	5	29	30	24	36	25	144	5	4	6	2	....	17
....	....	....	....	....	....	1	2	1	3	3	10	....	....	....	....	1	1
....	....	....	....	....	....	11	8	11	6	2	38	2	3	3	....	....	8
62	25	103	87	34	311	915	908	729	871	764	4187	115	98	185	124	127	649
2	1	2	1	1	7	18	21	15	18	14	86	4	3	4	4	4	19
Average No. of Reporters for the five weeks of March, 1·40.						Average No. of Reporters for the five weeks of March, 17·20.						Average No. of Reporters for the five weeks of March, 3·80.					

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. VI.						District No. VII.					
	Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.
	Mar. 3rd.	Mar. 10th.	Mar. 17th.	Mar. 24th.	Mar. 31st.		Mar. 3rd.	Mar. 10th.	Mar. 17th.	Mar. 24th.	Mar. 31st.	
1. Asthma (Spasmodic)	11	15	4	7	8	45	....	2	4	....	....	6
2. Anæmia	50	54	59	63	57	283	17	12	8	11	11	59
3. Accidents (Railroad, Machinery, etc.)	19	20	19	16	10	84	2	....	2	2	1	7
4. Blood Poisoning	3	2	2	3	2	12	....	....	....	....	....	......
5. Bright's Disease	11	9	7	4	3	34	2	2	2	2	3	11
6. Brain, Inflammation of	1	1	3	....	....	5	....	....	1	....	....	1
7. Bronchitis	74	99	86	73	74	406	71	54	40	63	64	292
8. Calculus	2	4	1	1	....	8	....	....	....	....	....	......
9. Cerebro-Spinal Meningitis	....	1	1	1	1	4	....	....	....	....	....	......
10. Cholera Infantum	7	4	....	2	....	13	....	....	....	....	....	......
11. Cholera Morbus	3	6	....	2	2	13	....	....	....	....	....	......
12. Consumption, Pulmonary	27	33	32	23	23	138	12	13	11	11	12	59
13. Croup, Membranous	5	....	6	2	....	13	....	....	....	....	....	......
14. Diphtheria	12	20	21	19	16	88	....	....	....	....	....	......
15. Diarrhœa	10	23	4	14	14	65	13	8	3	11	13	48
16. Dysentery	5	5	....	....	3	13	....	....	....	1	1	2
17. Erysipelas	7	7	6	6	6	32	7	4	3	10	8	32
18. Fever, Intermittent	21	18	8	11	13	71	36	38	27	28	40	169
19. Fever, Enteric	2	1	....	1	3	7	....	....	....	....	....	......
20. Fever, Typho-Malarial	1	6	3	2	4	16	3	....	....	....	....	3
21. Goitre	11	12	12	7	12	54	3	1	1	1	....	6
22. Gonorrhœa	10	10	4	3	7	34	....	1	....	3	2	6
23. Heart Disease, Organic	10	17	15	15	15	72	8	5	5	6	3	27
24. Influenza	58	111	105	67	52	393	21	41	37	33	31	163
25. Insanity	4	6	....	5	....	15	....	....	....	....	....	......
26. Measles	10	34	7	35	57	143	1	2	6	8	14	31
27. Mumps	21	11	20	9	15	76	1	1	....	....	....	2
28. Neuralgia	54	54	33	53	46	240	17	19	13	19	26	94
29. Peritonitis (non-puerperal)	2	4	1	1	5	13	2	3	2	....	1	8
30. Pneumonia	20	21	19	16	18	94	4	3	4	6	6	23
31. Pleurisy	6	9	11	10	8	44	2	3	1	1	....	7
32. Puerperal Fever	1	....	....	1	....	2	....	....	1	1	2	4
33. Rheumatism	21	23	24	20	23	111	12	7	7	11	7	44
34. Scarlatina	16	19	11	8	2	56	2	....	....	....	1	3
35. Small Pox	....	....	....	....	....	......	....	....	....	....	....	......
36. Syphilis	3	12	14	12	7	48	4	4	4	3	1	16
37. Tonsillitis	16	20	21	16	10	83	11	16	12	13	13	65
38. Tubercular Disease (other than pulmonary)	3	2	1	1	2	9	....	....	....	....	....	......
39. Whooping Cough	7	3	2	....	13	25	14	12	9	5	3	43
Total No. of Diseases	544	696	562	529	531	2862	265	251	203	249	263	1231
Number of Reporters for each week and month	14	15	13	13	13	68	6	5	5	5	5	26
	Average No. of Reporters for the five weeks of March, 13·60.						Average No. of Reporters for the five weeks of March, 5·20.					

October 1882, ending September 30th, 1883—*Continued.*

District No. VIII.						District No. IX.						District No. X.					
Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.
Mar. 3rd.	Mar. 10th.	Mar. 17th.	Mar. 24th.	Mar. 31st.		Mar. 3rd.	Mar. 10th.	Mar. 17th.	Mar. 24th.	Mar. 31st.		Mar. 3rd.	Mar. 10th.	Mar. 17th.	Mar. 24th.	Mar. 31st.	
2	1	10	1	2	16	1	1	1	1	....	4	1	2	4	5	1	13
8	11	5	7	11	42	4	4	5	5	3	21	19	11	15	19	16	80
8	5	1	2	4	20	1	2	3	2	1	9	10	7	12	....	1	30
....	....	1	1	....	2	....	....	1	....	....	1	1	....	1	....	1	3
2	2	....	2	2	8	1	2	3	2	2	10	1	....	6	8	....	15
1	....	....	....	....	1	....	....	....	1	....	1	....	2	....	....	1	3
33	34	27	29	57	180	7	11	21	10	12	61	43	37	49	46	26	201
....	....	....	....	....	....	1	....	1	1	....	3	....	....	....	....	1	1
....	....	....	....	....	....	....	....	....	1	....	1	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
6	8	4	5	6	29	2	1	1	1	2	7	10	7	11	16	3	47
....	....	....	....	....	....	....	1	....	....	....	1	....	....	1	2	....	3
1	2	1	3	4	11	1	3	3	2	3	12	3	4	13	6	5	31
6	3	6	5	12	32	2	1	2	5	5	15	7	2	2	1	3	15
....	....	1	....	....	1	....	1	1	....	....	2	1	1	1	....	....	3
1	1	....	....	....	2	1	2	2	2	1	8	3	1	5	4	3	16
29	33	32	36	46	176	....	....	1	....	1	2	28	33	46	47	24	178
....	....	....	....	....	....	....	1	1	1	....	3	1	....	4	2	....	7
....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	2	4
2	4	....	1	3	10	1	2	1	2	2	8	1	2	2	....	....	5
11	5	2	2	2	22	....	....	....	....	....	....	3	2	4	1	3	13
5	5	3	2	4	19	3	2	1	3	3	12	2	1	6	3	3	15
34	36	64	48	95	277	1	3	5	4	20	33	8	8	18	16	12	62
1	....	....	....	....	1	....	....	....	....	2	2	....	....	1	....	1	2
4	....	....	....	5	9	....	4	1	...	4	9	8	7	10	15	14	54
7	4	14	5	4	34	....	....	....	....	1	1	2	1	35	8	25	71
18	24	22	17	25	106	7	6	2	7	6	28	11	10	18	14	12	65
1	3	3	3	1	11	....	2	2	2	3	9	1	1	....	....	3	5
8	5	14	2	7	36	3	1	4	7	7	22	2	....	3	7	2	14
....	1	....	....	3	4	1	1	2	2	1	7	2	2	1	....	2	7
....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	2
14	13	5	4	8	44	6	6	4	3	4	23	7	6	10	10	5	38
2	6	3	2	....	13	1	....	3	3	1	8	2	....	5	....	2	9
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
1	3	1	1	1	7	....	....	....	....	1	1	3	4	3	5	1	16
6	8	5	12	10	41	2	4	9	6	4	25	4	9	12	8	9	42
....	....	1	2	....	3	....	1	....	....	1	2	....	....	2	2	1	5
1	7	2	2	1	13	....	....	....	....	....	....	....	....	3	2	....	5
212	224	227	194	313	1170	46	62	80	73	90	351	184	160	307	247	182	1080
8	9	6	5	9	37	3	5	5	5	4	22	5	5	8	7	6	31

Average No. of Reporters for the five weeks of March, 7·40.

Average No. of Reporters for the five weeks of March, 4·40.

Average No. of Reporters for the five weeks of March, 6·20.

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. I. — Number of Cases for week ending: Apr. 7th.	Apr. 14th.	Apr. 21st.	Apr. 28th.	Total Cases for Month.	District No. II. — Number of Cases for week ending: Apr. 7th.	Apr. 14th.	Apr. 21st.	Apr. 28th.	Total Cases for Month.
1. Asthma (Spasmodic)	1	....	1	...	2	3	3	3	2	11
2. Anæmia	9	9	11	9	38	25	32	25	18	100
3. Accidents (Railroad, Machinery, etc.)	2	1	4	3	10	4	2	....	3	9
4. Blood Poisoning	....	1	....	1	2	1	1	1	....	3
5. Bright's Disease	1	....	....	....	1	2	....	....	1	3
6. Brain, Inflammation of	....	....	....	....	.....	....	1	2	....	3
7. Bronchitis	20	16	16	12	64	39	46	38	28	151
8. Calculus	....	....	....	....	......	....	...	...	1	1
9. Cerebro-Spinal Meningitis	....	....	....	....	......	....	....	....	....	......
10. Cholera Infantum	....	....	....	....	......	..	1	....	....	1
11. Cholera Morbus	....	....	....	....	......	....	....	1	4	5
12. Consumption, Pulmonary	4	6	8	6	24	7	14	7	10	38
13. Croup, Membranous	....	2	2	....	4	2	....	....	....	2
14. Diphtheria	....	....	....	....	......	....	3	2	1	6
15. Diarrhœa	....	7	7	5	19	5	12	9	7	33
16. Dysentery	....	....	....	....	.....	....	1	....	1	2
17. Erysipelas	....	...	3	....	3	4	6	4	9	23
18. Fever, Intermittent	....	....	1	....	1	5	8	8	8	29
19. Fever, Enteric	....	....	....	....	......	2	1	4	2	9
20. Fever, Typho-Malarial	....	....	....	.. .	......	1	1	....	1	3
21. Goitre	1	2	2	....	5	7	6	5	6	24
22. Gonorrhœa	3	2	1	....	6	....	....	1	....	1
23. Heart Disease, Organic	2	4	5	5	16	3	4	4	4	15
24. Influenza	36	13	25	23	97	70	28	26	16	140
25. Insanity	1	1	1	1	4	1	....	....	....	1
26. Measles	....	....	....	....	.....	7	11	9	4	31
27. Mumps	17	11	15	8	51	20	20	44	20	104
28. Neuralgia	8	5	10	6	29	21	17	14	17	69
29. Peritonitis (non-puerperal)	....	1	....	1	2	....	2	5	4	11
30. Pneumonia	5	4	2	2	13	2	7	7	5	21
31. Pleurisy	2	4	3	1	10	1	....	4	1	6
32. Puerperal Fever	1	....	3	....	4	3	1	2	1	7
33. Rheumatism	5	6	10	5	26	12	11	9	6	38
34. Scarlatina	....	2	4	....	6	2	1	2	3	8
35. Small Pox	....	....	....	....	......	....	....	....	....	......
36. Syphilis	1	1	....	....	2	1	....	....	....	1
37. Tonsillitis	6	7	5	1	19	15	10	4	3	32
38. Tubercular Disease (other than pulmonary)	....	1	3	1	5	....	....	....	....	......
39. Whooping Cough	2	1	5	....	8	6	8	5	5	24
Total No. of Diseases	127	107	147	90	471	271	258	245	191	965
Number of Reporters for each week and month	4	4	6	4	18	8	7	7	6	28
	Average No. of Reporters for the four weeks of April, 4·50.					Average No. of Reporters for the four weeks of April, 7·00.				

October, 1882, ending September, 30th, 1883—*Continued.*

District No. III.					District No. IV.					District No. V.				
Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
Apr. 7th.	Apr. 14th.	Apr. 21st.	Apr. 28th.		Apr. 7th.	Apr. 14th.	Apr. 21st.	Apr. 28th.		Apr. 7th.	Apr. 14th.	Apr. 21st.	Apr. 28th.	
......	......	1	2	3	11	15	12	9	47	......	......	1	3	4
......	......	4	2	6	36	46	48	42	172	5	9	9	5	28
1	5	1	4	11	23	21	13	18	75	5	7	5	4	21
......	......	......	......	......	5	2	1	4	12	1	......	......	......	1
......	......	......	1	1	5	6	4	8	23	......	3	3	......	6
......	......	......	20	20	4	1	1	4	10	......	......	......	7	7
15	10	7	......	32	75	99	71	82	327	5	9	11	2	27
......	......	......	......	......	2	2	......	2	6	......	......	......	......	......
......	3	8	7	18	2	4	1	3	10	......	......	1	2	3
......	......	......	......	......	......	4	1	3	8	......	......	......	......	......
......	......	......	......	......	......	......	9	1	10	......	......	......	1	1
......	......	......	......	......	35	34	45	40	154	3	7	5	......	15
......	1	1	......	2	2	3	3	3	11	......	2	......	......	2
......	......	......	2	2	5	11	7	8	31	4	......	......	3	7
21	11	......	17	49	42	36	69	58	205	1	5	3	1	10
......	......	......	......	......	9	5	6	8	28	1	......	......	2	3
2	3	......	5	10	14	12	10	19	55	......	3	2	4	9
......	1	......	1	2	33	21	29	33	116	......	......	......	......	......
......	......	......	......	......	3	2	1	7	13	......	......	......	......	......
......	......	......	......	......	4	2	5	9	20	1	1	......	1	3
......	......	......	......	......	8	11	5	4	28	1	8	6	1	16
......	8	......	11	19	8	5	7	11	31	2	1	3	......	6
......	......	......	......	......	20	32	29	24	105	1	1	1	6	9
40	23	8	25	96	59	69	66	58	252	12	5	8	......	25
......	......	1	......	1	2	3	3	3	11	......	......	......	......	......
......	......	3	5	8	113	108	73	88	382	......	4	3	......	7
......	......	......	......	......	......	14	31	9	54	2	2	1	9	14
7	9	2	16	34	48	44	47	41	180	4	11	10	7	32
......	......	......	......	......	4	8	10	5	27	1	1	3	1	6
4	5	......	3	12	38	27	26	25	116	6	9	6	1	22
......	1	......	1	2	11	7	11	6	35	......	5	1	......	6
......	......	......	......	......	1	2	2	2	7	......	......	1	......	1
11	17	3	14	45	40	32	42	44	158	2	10	7	6	25
......	......	......	......	......	6	2	8	4	20	......	1	5	2	8
......	......	......	......	......	......	2	4	......	6	......	......	......	......	......
4	2	......	4	10	12	12	8	10	42	1	6	6	2	15
7	7	2	8	24	31	23	25	21	100	3	6	5	4	18
......	......	......	......	......	5	4	1	3	13	1	1	......	1	3
......	......	......	......	......	8	9	12	6	35	......	4	1	......	5
112	106	41	148	407	724	740	746	725	2935	62	121	107	75	365
1	2	2	3	8	16	16	15	16	63	3	4	3	3	13

Average No. of Reporters for the four weeks of April, 2·00.

Average No. of Reporters for the four weeks of April, 15·75.

Average No. of Reporters for the four weeks of April, 3·25.

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. VI.					District No. VII.				
	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
	Apr. 7th.	Apr. 14th.	Apr. 21st.	Apr. 28th.		Apr. 7th.	Apr. 14th.	Apr. 21st.	Apr. 28th.	
1. Asthma (Spasmodic)	11	2	8	12	33	....	...	....	1	1
2. Anæmia	63	39	72	62	236	12	11	9	11	43
3. Accidents (Railroad, Machinery, etc.)	18	18	18	12	66	2	6	2	2	12
4. Blood Poisoning	2	1	2	2	7	....	....	1	....	1
5. Bright's Disease	10	9	10	7	36	5	5	4	4	18
6. Brain, Inflammation of	2	3	2	1	8	....	....	...	....	......
7. Bronchitis	88	52	69	66	275	50	38	42	44	174
8. Calculus	....	....	1	....	1	....	....	....	....	......
9. Cerebro-Spinal Meningitis	2	2	1	....	5	1	1	....	....	2
10. Cholera Infantum	5	....	1	....	6	....	....	....	....	......
11. Cholera Morbus	3	2	....	1	6	...	....	....	....	......
12. Consumption, Pulmonary	30	19	28	20	97	11	9	9	9	38
13. Croup, Membranous	5	7	2	2	16	....	....	....	....	.....
14. Diphtheria	22	15	18	22	77	....	....	....	....	.....
15. Diarrhœa	22	9	20	26	77	12	10	12	12	46
16. Dysentery	3	1	1	2	7	....	....	....	1	1
17. Erysipelas	13	10	16	16	55	3	5	3	4	15
18. Fever, Intermittent	25	19	18	14	76	40	37	30	32	139
19. Fever, Enteric	3	....	4	5	12	...	....	....	....	......
20. Fever, Typho-Malarial	....	. .	5	....	5	....	....	...	....	......
21. Goitre	10	8	12	8	38	1	....	....	3	4
22. Gonorrhœa	11	3	12	5	31	3	2	1	2	8
23. Heart Disease, Organic	20	16	16	17	69	4	5	6	7	22
24. Influenza	82	48	47	44	221	17	19	15	11	62
25. Insanity	2	1	4	1	8	....	....	....	1	1
26. Measles	58	10	38	22	128	22	14	6	....	42
27. Mumps	12	4	11	3	30	1	....	....	....	1
28. Neuralgia	59	39	49	41	188	19	14	17	18	68
29. Peritonitis (non-puerperal)	5	3	8	4	20	1	....	....	....	1
30. Pneumonia	21	16	22	22	81	5	7	3	....	15
31. Pleurisy	13	8	12	10	43	....	....	1	1	2
32. Puerperal Fever	2	1	2	2	7	....	....	....	....	......
33. Rheumatism	31	18	31	26	106	13	11	12	9	45
34. Scarlatina	8	8	11	....	27	3	....	....	1	4
35. Small Pox	....	....	....	....	....	....	....	....	....	......
36. Syphilis	14	5	14	5	38	2	3	3	....	8
37. Tonsillitis	22	5	·11	16	54	7	10	4	6	27
38. Tubercular Disease (other than pulmonary)	1	3	3	2	9	....	....	....	....	......
39. Whooping Cough	6	2	4	....	12	2	....	6	2	10
Total No. of Diseases	704	406	603	498	2211	236	207	186	181	810
Number of Reporters for each week and month	16	12	15	13	56	5	5	5	5	20
	Average No. of Reporters for the four weeks of April, 14·00.					Average No. of Reporters for the four weeks of April, 5·00.				

October, 1882, ending September 30th, 1883—*Continued.*

District No. VIII.					District No. IX.					District No. X.				
Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
Apr. 7th.	Apr. 14th.	Apr. 21st.	Apr. 28th.		Apr. 7th.	Apr. 14th.	Apr. 21st.	Apr. 28th.		Apr. 7th.	Apr. 14th.	Apr. 21st.	Apr. 28th.	
4	3	4	5	16	......	1	3	1	5	2	2	2	2	8
11	12	16	15	54	......	3	8	16	27	6	9	18	14	47
9	6	4	7	26	2	1	1	1	5	3	1	6	3	13
......	......	......	......	......	1	1	1	......	3	......	1	3	2	6
2	4	3	3	12	2	......	1	1	4	......	......	2	2	4
......	......	......	......	......	1	......	......	......	1	2	......	......	......	2
20	38	39	37	134	10	12	12	12	46	29	13	24	22	88
......	......	......	1	1	1	......	......	2	3	2	1	......	2	5
......	......	......	......	......	......	1	......	2	3	......	......	1	1	2
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	1	......	1	......	......	......	1	1
3	4	4	8	19	1	1	2	2	6	3	3	16	11	33
1	2	......	......	3	......	......	......	1	1	......	......	1	......	1
......	......	4	......	4	12	1	1	......	14	1	4	4	6	15
9	6	5	6	26	1	5	4	6	16	2	1	1	3	7
......	......	......	1	1	......	......	......	......	......	1	......	1	......	2
......	1	3	5	9	......	2	2	1	5	4	1	4	5	14
26	41	47	34	148	......	......	1	1	2	31	32	50	51	164
......	......	......	......	......	......	......	......	......	......	......	......	1	......	1
1	2	1	1	5	......	......	......	......	......	1	......	1	2	4
1	2	3	......	6	1	1	......	......	2	......	1	......	......	1
1	......	3	1	5	......	......	......	1	1	......	2	1	3	6
1	7	7	5	20	1	2	1	4	8	3	2	2	2	9
28	31	22	18	99	12	11	4	7	34	8	11	13	15	47
......	1	2	......	3	......	1	......	2	3	1	......	......	2	3
2	1	......	......	3	3	......	......	4	7	20	15	13	18	66
3	4	17	5	29	......	......	......	......	......	19	13	16	8	56
26	18	16	23	83	15	4	6	11	36	11	8	11	19	49
1	3	2	3	9	3	2	2	2	9	......	......	......	......	......
7	2	7	5	21	2	4	3	5	14	4	6	12	7	29
2	......	2	3	7	1	1	......	2	4	......	1	4	2	7
......	......	......	......	......	......	1	......	......	1	......	......	......	......	......
11	6	13	9	39	4	9	6	5	24	7	7	13	14	41
3	......	5	......	8	1	3	4	3	11	1	2	1	......	4
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	......	......	1	2	2	2	7
7	9	5	10	31	4	1	5	1	11	6	4	9	7	26
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
1	8	......	10	19	......	......	......	......	......	......	......	......	......	......
180	211	234	215	840	78	68	68	93	307	168	142	232	226	768
7	6	8	8	29	3	4	4	5	16	6	5	7	7	25

Average No. of Reporters for the four weeks of April, 7·25.

Average No. of Reporters for the four weeks of April, 4·00.

Average No. of Reporters for the four weeks of April, 6·25.

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. I. — Number of Cases for week ending May 5th.	May 12th.	May 19th.	May 26th.	Total Cases for Month.	District No. II. — Number of Cases for week ending May 5th.	May 12th.	May 19th.	May 26th.	Total Cases for Month.
1. Asthma (Spasmodic)	2	1	1	1	5	2	1	5	6	14
2. Anæmia	11	8	12	10	41	27	25	18	22	92
3. Accidents (Railroad, Machinery, etc.)	3	2	10	5	20	2	7	8	4	21
4. Blood Poisoning	....	....	1	....	1	....	1	....	2	3
5. Bright's Disease	1	1	....	....	2	2	2	2	1	7
6. Brain, Inflammation of	....	....	1	1	2	....	....	....	1	1
7. Bronchitis	18	9	9	14	50	27	31	25	26	109
8. Calculus	1	....	....	....	1	....	1	....	....	1
9. Cerebro-Spinal Meningitis	1	....	....	....	1	3	3	1	...	7
10. Cholera Infantum	....	....	....	....	.....	....	....	....	....	.....
11. Cholera Morbus	....	....	....	1	1	....	5	3	6	14
12. Consumption, Pulmonary	11	7	2	5	25	6	8	8	10	32
13. Croup, Membranous	2	....	....	....	2	1	....	3	1	5
14. Diphtheria	18	2	....	....	20	2	13	1	....	16
15. Diarrhœa	7	5	7	8	27	2	11	6	8	27
16. Dysentery	1	1	1	....	3	1	4	2	1	8
17. Erpsipelas	3	2	3	3	11	3	3	3	5	14
18. Fever, Intermittent	....	....	3	....	3	17	23	9	11	60
19. Fever, Enteric	....	9	1	....	10	3	4	5	3	15
20. Fever, Typho-Malarial	....	....	....	....	.....	3	1	1	....	5
21. Goitre	3	1	2	2	8	1	5	5	5	16
22. Gonorrhœa	4	1	1	7	13	....	2	1	1	4
23. Heart Disease, Organic	7	1	2	6	16	2	2	2	4	10
24. Influenza	28	10	10	9	57	24	24	10	7	65
25. Insanity	....	....	1	3	4	....	2	2	2	6
26. Measles	....	1	....	2	3	3	7	....	....	10
27. Mumps	28	3	6	6	43	27	39	26	17	109
28. Neuralgia	6	9	7	9	31	13	13	18	22	66
29. Peritonitis (non-puerperal)	....	....	2	....	2	2	1	4	1	8
30. Pneumonia	5	4	2	10	21	4	8	9	8	29
31. Pleurisy	4	1	1	1	7	3	3	2	3	11
32. Puerperal Fever	...	2	2	....	4	....	1	1	....	2
33. Rheumatism	11	3	2	6	22	9	16	17	12	54
34. Sçarlatina	2	4	2	3	11	4	1	2	5	12
35. Small Pox	....	....	....	....	.....	....	....	....	....	.....
36. Syphilis	2	1	1	4	8	....	....	....	1	1
37. Tonsillitis	9	4	1	5	19	3	12	9	8	32
38. Tubercular Disease (other than pulmonary)	4	....	1	1	6	1	....	2	1	4
39. Whooping Cough	27	....	....	....	27	....	4	....	5	9
Total No. of Diseases	219	92	94	122	527	197	283	210	209	899
Number of Reporters for each week and month	6	4	4	6	20	6	8	9	8	31
	Average No. of Reporters for the four weeks of May, 5·00.					Average No. of Reporters for the four weeks of May, 7·75.				

October, 1882, ending September 30th, 1883—*Continued.*

District No. III.					District No. IV.					District No. V.				
Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
May 5th.	May 12th.	May 19th.	May 26th.		May 5th.	May 12th.	May 19th.	May 26th.		May 5th.	May 12th.	May 19th.	May 26th.	
2	2	.....	.....	4	23	4	10	9	46	3	.....	2	2	7
5	5	4	1	15	64	29	40	37	170	11	11	14	11	47
4	3	4	7	18	21	19	22	22	84	9	6	6	8	29
.....	.....	.....	.....	.....	5	.....	1	3	9	.....	.....	1	.....	1
.....	1	2	.....	3	8	4	10	6	28	3	2	2	4	11
15	2	1	.....	18	3	.....	2	3	8	1	1	.....	.....	2
.....	5	8	6	19	111	69	81	64	325	20	13	25	19	77
.....	.....	.....	.....	.....	1	2	1	1	5	1	.....	.....	.....	1
5	8	8	10	31	8	1	4	4	17	1	.....	1	.....	2
.....	.....	.....	.....	.....	3	.....	2	2	7	4	3	6	4	17
.....	.....	.....	.....	.....	2	.....	.....	2	4	2	1	2	.....	5
1	1	1	.....	3	45	22	26	30	123	7	7	5	8	27
1	.....	1	1	3	6	.....	1	2	9	.....	.....	2	.....	2
.....	.....	1	2	3	13	5	6	3	27	1	1	5	2	9
14	14	8	10	46	59	30	29	28	146	7	3	2	8	20
.....	.....	.....	.....	.....	4	.....	2	1	7	.....	1	.....	1	2
2	3	.....	2	7	19	10	23	15	67	8	7	6	7	28
.....	1	.....	.....	1	40	6	25	16	87	6	3	8	4	21
.....	.....	.....	.....	.....	10	3	2	3	18	.....	.....	.....	.....	.....
.....	.....	1	.....	1	8	6	7	4	25	.....	1	3	2	6
4	2	2	5	13	8	2	4	15	29	10	7	6	8	31
15	11	2	4	32	16	6	4	10	36	2	1	.....	2	5
.....	1	1	1	3	31	11	24	23	89	3	1	3	3	10
14	24	14	14	66	67	27	44	25	163	8	6	8	7	29
1	.....	.....	.....	1	6	1	3	6	16	1	1	2	2	6
23	4	5	.....	32	106	48	62	70	286	6	4	7	4	21
15	.....	1	.....	16	22	6	15	12	55	11	5	26	7	49
.....	10	16	6	32	52	24	42	36	154	14	11	14	36	75
.....	.....	.....	.....	.....	8	.....	4	5	17	.....	.....	.....	.....	.....
3	3	4	.....	10	42	25	28	20	115	4	1	2	3	10
2	1	2	.....	5	15	3	7	9	34	3	2	2	1	8
19	.....	.....	.....	19	1	1	2	2	6	1	.....	.....	1	2
.....	24	16	12	52	42	21	39	49	151	20	6	27	18	71
.....	.....	.....	.....	.....	12	6	8	15	41	8	4	12	10	34
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
8	4	2	3	17	7	7	8	11	33	7	6	7	7	27
4	3	2	5	14	29	15	17	25	86	8	5	8	8	29
.....	.....	.....	.....	.....	4	1	5	6	16	2	.....	3	1	6
.....	.....	.....	.....	.....	7	1	14	13	35	6	4	3	4	17
157	132	106	89	484	928	415	624	607	2574	198	124	220	202	744
3	3	3	2	11	19	12	15	16	62	5	3	5	5	18
Average No. of Reporters for the four weeks of May, 2·75.					Average No. of Reporters for the four weeks of May, 15·50.					Average No. of Reporters for the four weeks of May, 4·50.				

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. VI. Number of Cases for week ending					District No. VII. Number of Cases for week ending				
	May 5th.	May 12th.	May 19th.	May 26th.	Total Cases for Month.	May 5th.	May 12th.	May 19th.	May 26th.	Total Cases for Month.
1. Asthma (Spasmodic)	8	5	5	8	26	....	....	1	2	3
2. Anæmia	75	64	65	62	266	14	16	20	16	66
3. Accidents (Railroad, Machinery, etc.)	13	13	15	15	56	1	2	4	....	7
4. Blood Poisoning	3	4	3	3	13	1	....	....	....	1
5. Bright's Disease	7	6	6	8	27	2	3	2	2	9
6. Brain, Inflammation of	....	1	....	3	4	....	....	....	....	.....
7. Bronchitis	65	52	33	44	194	37	45	39	37	158
8. Calculus	....	2	2	5	9	..	....	....	....	.....
9. Cerebro-Spinal Meningitis	1	....	1	....	2	....	....	....	1	1
10. Cholera Infantum	....	1	2	2	5	....	....	....	....	.....
11. Cholera Morbus	....	1	....	1	2	....	....	8	....	8
12. Consumption, Pulmonary	31	17	16	23	87	9	11	9	10	39
13. Croup, Membranous	7	2	....	....	9	...	....	....	...	.....
14. Diphtheria	14	13	13	11	51	5	12	6	4	27
15. Diarrhœa	28	14	21	19	82	13	14	18	15	60
16. Dysentery	3	3	1	1	8	1	1	1	1	4
17. Erysipelas	15	9	6	13	43	3	2	1	2	8
18. Fever, Intermittent	22	22	19	15	78	29	43	38	33	143
19. Fever, Enteric	....	...	....	1	1	....	....	....	....	.....
20. Fever, Typho-Malarial	1	....	2	...	3	....	....	....	....	.....
21. Goitre	12	10	8	14	44	2	....	....	1	3
22. Gonorrhœa	7	5	3	7	22	2	1	....	3	6
23. Heart Disease, Organic	16	14	14	18	62	5	4	7	5	21
24. Influenza	46	17	26	27	116	9	10	5	2	26
25. Insanity	5	5	3	2	15	....	2	1	....	3
26. Measles	51	16	13	46	126	....	....	....	....	.....
27. Mumps	8	9	3	6	26	....	1	1	....	2
28. Neuralgia	60	38	45	41	184	16	13	15	21	65
29. Peritonitis (non-puerperal)	4	2	2	3	11	....	...	1	1	2
30. Pneumonia	21	19	18	14	72	2	3	3	2	10
31. Pleurisy	13	11	10	6	40	1	1	....	....	2
32. Puerperal Fever	....	....	....	....	.....	....	....	....	....	.....
33. Rheumatism	25	22	21	27	95	5	10	6	9	30
34. Scarlatina	3	..	4	...	7	2	1	3	7	13
35. Small Pox	....	....	....	....	.....	....	....	....	....	.....
36. Syphilis	10	10	10	13	43	....	...	1	....	1
37. Tonsillitis	15	15	8	16	54	7	9	16	16	48
38. Tubercular Disease (other than pulmonary)	2	2	2	1	7	....	....	....	....	.....
39. Whooping Cough	8	7	5	3	23	8	10	10	5	33
Total No. of Diseases	599	431	405	478	1913	174	214	216	195	799
Number of Reporters for each week and month	14	11	12	13	50	5	5	5	5	20
	Average No. of Reporters for the four weeks of May, 12·50.					Average No. of Reporters for the four weeks of May, 5·00.				

October, 1882, ending September 30th, 1883—*Continued.*

District No. VIII.					District No. IX.					District No. X.				
Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
May 5th.	May 12th.	May 19th.	May 26th.		May 5th.	May 12th.	May 19th.	May 26th.		May 5th.	May 12th.	May 19th.	May 26th.	
1	2	2	5	10	1	......	......	......	1	4	4	1	2	11
14	8	18	16	56	7	6	9	4	26	15	15	10	18	58
5	5	7	3	20	3	1	1	4	9	4	7	5	4	20
......	......	2	1	3	1	......	1	1	3	......	......	2	3	5
2	1	2	......	5	1	1	2	4	8	......	......	2	3	5
......	......	1	2	3	......	......	1	1	2	1	......	1	......	2
26	28	39	23	116	13	10	9	6	38	24	34	36	20	114
1	2	1	......	4	2	......	1	......	3	......	......	......	......	......
......	......	......	......	......	4	2	......	1	7	......	......	......	......	......
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	......	......	1	1	......	2	4
6	8	12	10	36	2	1	3	2	8	4	15	14	10	43
1	......	......	......	1	1	......	1	1	3	......	......	......	1	1
......	2	5	3	10	......	2	1	2	5	9	6	2	2	19
7	7	5	8	27	2	3	......	......	5	5	1	2	1	9
......	1	1	......	2	......	......	......	......	......	......	......	......	......	......
2	7	5	3	17	......	1	2	2	4	7	8	4	5	24
37	53	64	55	209	1	......	1	......	2	60	71	42	40	213
......	......	......	......	......	1	......	......	......	1	......	1	......	1	2
......	3	5	5	13	......	......	......	1	1	1	3	......	......	4
1	2	4	6	13	1	......	2	1	4	......	1	1	......	2
......	5	4	3	12	......	......	......	......	......	3	2	3	2	10
6	4	7	4	21	1	......	4	1	6	6	6	5	5	22
8	28	13	14	63	......	3	3	4	10	3	2	2	4	11
......	1	......	......	1	......	1	......	......	1	1	1	1	......	3
1	5	2	......	8	1	......	......	......	1	24	14	33	28	99
3	11	12	21	47	......	......	2	2	4	20	5	11	8	44
13	23	18	21	75	7	5	6	4	22	12	21	11	11	55
2	2	3	......	7	1	1	1	1	4	......	......	......	......	......
2	4	4	3	13	2	1	2	2	7	3	4	3	1	11
......	2	2	2	6	......	1	1	......	2	2	4	4	1	11
......	1	3	......	4	......	......	......	......	......	2	1	2	......	5
7	5	4	12	28	6	3	6	3	18	21	29	19	14	83
2	8	2	......	12	4	......	......	1	5	2	......	......	3	5
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
......	......	......	1	1	......	......	......	......	......	2	4	2	2	10
5	4	7	8	24	3	2	4	2	11	8	14	5	3	31
......	......	2	1	3	......	......	1	......	1	......	......	......	......	......
......	24	10	16	50	......	......	......	......	......	2	......	6	4	12
152	256	266	246	920	65	44	64	49	222	246	274	229	199	948
5	8	8	8	29	5	4	4	4	17	7	8	7	7	29

Average No. of Reporters for the four weeks of May, 7·25.

Average No. of Reporters for the four weeks of May, 4·25.

Average No. of Reporters for the four weeks of May, 7·25.

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. I.						District No. II.					
	Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.
	June 2nd.	June 9th.	June 16th.	June 23rd.	June 30th.		June 2nd.	June 9th.	June 16th.	June 23rd.	June 30th.	
1. Asthma (Spasmodic)	....	....	3	3	1	7	5	4	5	2	2	18
2. Anæmia	3	10	4	8	10	35	19	20	22	14	16	91
3. Accidents (Railroad, Machinery, etc.)	2	4	3	8	2	19	4	6	4	8	4	26
4. Blood Poisoning	...	1	1	....	....	2	....	2	...	....	....	2
5. Bright's Disease	....	2	1	3	2	8	....	2	1	1	....	4
6. Brain, Inflammation of	1	....	....	....	1	2	1	2	1	1	3	8
7. Bronchitis	6	10	13	12	11	52	20	15	13	10	10	68
8. Calculus	....	....	1	....	1	2	....	....	...	2	2	4
9. Cerebro-Spinal Meningitis	....	....	....	....	....	....	....	....	....	....	....	....
10. Cholera Infantum	....	1	...	2	1	4	2	2	....	6	3	13
11. Cholera Morbus	....	....	1	....	....	1	9	2	1	1	2	15
12. Consumption, Pulmonary	3	6	4	3	2	18	11	11	11	10	9	52
13. Croup, Membranous	..	....	....	....	....	....	....	1	....	....	....	1
14. Diphtheria	1	1	....	....	1	3	1	2	2	5	2	12
15. Diarrhœa	4	6	6	18	13	47	7	6	14	16	11	54
16. Dysentery	..	....	....	....	2	2	....	2	2	....	....	4
17. Erysipelas	1	2	3	2	...	8	3	3	1	2	3	12
18. Fever, Intermittent	....	....	....	....	1	1	18	10	10	13	9	60
19. Fever, Enteric	....	....	....	....	..	......	3	....	2	1	2	8
20. Fever, Typho-Malarial	....	....	....	....	....	....	....	....	3	1	....	4
21. Goitre	1	2	1	2	2	8	11	7	7	6	4	35
22. Gonorrhœa	2	3	1	3	2	11	1	3	4	3	3	14
23. Heart Disease, Organic	....	5	5	4	2	16	6	2	4	4	1	17
24. Influenza	1	6	2	4	....	13	6	8	6	10	7	37
25. Insanity	....	1	2	....	1	4	....	3	1	3	2	9
26. Measles	....	2	....	3	....	5	2	....	10	....	....	12
27. Mumps	6	8	10	6	6	36	8	10	5	5	2	30
28. Neuralgia	6	6	6	10	15	43	16	15	15	12	15	73
29. Peritonitis (non-puerperal)	....	....	....	....	....	......	....	3	1	4	2	10
30. Pneumonia	2	2	....	3	2	9	5	6	4	4	5	24
31. Pleurisy	1	2	2	3	2	10	2	....	1	4	1	8
32. Puerperal Fever	1	1	1	3	1	7	2	3	1	3	....	9
33. Rheumatism	2	8	6	11	9	36	14	16	19	13	10	72
34. Scarlatina	9	12	1	6	....	28	3	1	4	2	1	11
35. Small Pox	....	....	....	....	....	......	....	....	...	....	..	....
36. Syphilis	1	4	3	4	3	15	1	1	....	2	8	12
37. Tonsillitis	3	7	1	4	4	19	7	2	2	5	4	20
38. Tubercular Disease (other than pulmonary)	1	1	....	....	....	2	1	....	....	....	1	2
39. Whooping Cough	....	....	....	7	5	12	1	....	....	1	....	2
Total No. of Diseases	57	113	81	132	102	485	189	170	176	174	144	853
Number of Reporters for each week and month	4	5	4	6	5	24	8	7	7	8	7	37
	Average No. of Reporters for the five weeks of June, 4·80.						Average No. of Reporters for the five weeks of June, 7·40.					

October 1882, ending September 30th, 1883—*Continued.*

District No. III.						District No. IV.						District No. V.					
Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.
June 2nd.	June 9th.	June 16th.	June 23rd.	June 30th.		June 2nd.	June 9th.	June 16th.	June 23rd.	June 30th.		June 2nd.	June 9th.	June 16th.	June 23rd.	June 30th.	
....	1	....	....	....	1	13	9	7	8	6	43	1	2	....	....	....	3
2	2	1	2	2	9	56	32	33	51	23	195	6	12	11	5	7	41
5	1	2	6	....	14	21	11	20	17	18	87	5	12	11	4	10	42
...	1	....	....	..	1	5	2	1	4	1	13	....	....	....	1	....	1
1	....	....	1	2	4	4	9	1	6	6	26	....	3	2	..	2	7
....	....	....	....	....	....	5	2	2	2	1	12	....	1	....	....	....	1
6	8	2	4	2	22	64	45	43	36	24	212	9	16	18	4	8	55
....	....	....	....	....	....	1	4	3	1	3	12	1	....	....	....	....	1
8	6	....	....	....	14	2	5	1	3	1	12	....	1	1	....	1	3
....	....	....	....	....	....	2	3	1	5	2	13	4	3	4	3	....	14
....	....	....	....	....	....	4	....	....	1	4	9	1	1	1	....	....	3
....	1	....	....	....	1	33	21	17	31	20	122	3	10	9	....	6	28
1	....	....	....	....	1	....	5		....	..	5	....	....	....	....	....	....
....	....	4	2	...	6	5	8	6	14	1	34	1	4	6	3	....	14
4	2	11	13	....	30	18	10	20	21	16	85	6	6	5	7	2	26
1	...	...	....	....	1	2	1	2	3	1	9	1	....	1	....	....	2
5	2	3	3	1	14	20	14	7	10	2	53	3	5	7	3	2	20
....	....	....	....	....	....	11	8	13	15	15	62	4	9	7	3	3	26
....	....	....	3	....	3	....	....	4	5	3	12	....	....	....	....	1	1
..	....	1	6	5	12	11	5	5	9	1	31	4	1	1	1	1	8
....	....	1	....	....	1	6	12	5	5	4	32	....	5	6	2	3	16
....	4	....	3	....	7	5	2	8	7	6	28	....	2	2	....	1	5
....	....	....	1	2	3	30	27	16	23	18	114	....	1	3	....	2	6
....	....	....	....	....	....	27	16	12	11	3	69	1	5	2	2	....	10
....	....	....	1	1	2	4	3	5	3	1	16	....	1	3	....	2	6
....	3	....	7	....	10	69	66	47	15	16	213	1	7	4	....	....	12
....	16	....	1	...	17	3	2	12	7	2	26	25	18	15	5	2	65
7	5	8	1	2	23	37	35	29	33	29	163	1	15	16	7	6	45
....	....	....	....	....	....	6	4	3	4	2	19	....	....	1	....	1	2
2	..	2	1	....	5	15	9	11	18	19	72	1	2	3	....	....	6
....	1	....	....	....	1	7	6	2	5	3	23	2	1	1	....	2	6
...	....	....	1	....	1	2	3	2	5	2	14	....	1	....	1	1	3
10	3	14	7	2	36	42	24	28	36	22	152	7	10	12	7	2	38
....	....	....	....	....	....	3	3	3	4	5	18	....	2	1	....	....	3
...	....	...	....	....	....	....	....	...	....	....	....	....	....	....	....	....	....
....	....	2	....	...	2	6	5	6	5	11	33	....	7	7	....	7	21
3	....	4	1	....	8	13	12	8	14	5	52	1	5	3	3	3	15
....	....	....	....	....	..	6	2	4	3	2	17	1	2	2	....	1	6
9	2	....	4	...	15	16	14	10	....	4	44	....	....	....	1	....	1
64	58	55	68	19	264	574	439	397	440	302	2152	89	170	165	62	76	562
2	2	2	2	1	9	16	13	14	14	13	70	3	5	5	2	3	18
Average No. of Reporters for the five weeks of June, 1·80.						Average No. of Reporters for the five weeks of June, 14·00.						Average No. of Reporters for the five weeks of June, 3·60.					

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. VI.						District No. VII.					
	Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.
	June 2nd.	June 9th.	June 16th.	June 23rd.	June 30th.		June 2nd.	June 9th.	June 16th.	June 23rd.	June 30th.	
1. Asthma (Spasmodic)	9	13	4	11	2	39	2	1	1	1	1	6
2. Anæmia	60	53	60	71	48	292	14	13	10	13	16	66
3. Accidents (Railroad, Machinery, etc.)	11	14	16	25	12	78	1	....	2	2	5	10
4. Blood Poisoning	4	4	3	4	1	16	....	....	....	1	....	1
5. Bright's Disease	6	9	1	7	2	25	5	3	3	2	1	14
6. Brain, Inflammation of	2	1	1	1	1	6	....	....	....	....	....	......
7. Bronchitis	37	28	26	34	18	143	27	27	18	10	10	92
8. Calculus	3	2	3	3	2	13	....	....	....	....	....	......
9. Cerebro-Spinal Meningitis	....	1	1	3	1	6	1	1	2	1	....	5
10. Cholera Infantum	3	4	....	13	4	24	....	....	....	....	....	......
11. Cholera Morbus	3	3	1	8	2	17	....	....	....	....	....	......
12. Consumption, Pulmonary	20	25	13	21	10	89	8	7	7	8	9	39
13. Croup, Membranous	4	2	4	2	...	12	....	....	....	....	....	......
14. Diphtheria	1	12	5	10	9	37	4	....	...	2	3	9
15. Diarrhœa	22	35	15	31	17	120	13	12	14	9	9	57
16. Dysentery	....	5	1	11	2	19	....	....	..	....	....	......
17. Erysipelas	7	5	5	8	3	28	2	2	2	1	3	10
18. Fever, Intermittent	10	12	15	9	15	61	50	41	38	32	31	192
19. Fever, Enteric	....	3	3	3	....	9	....	....	....	....	10	10
20. Fever, Typho-Malarial	....	1	....	8	2	11	....	....	....	1	1	2
21. Goitre	8	10	6	8	3	35	1	1	....	....	1	3
22. Gonorrhœa	3	9	4	3	5	24	....	....	....	2	2	4
23. Heart Disease, Organic	19	20	16	22	18	95	4	4	3	6	6	23
24. Influenza	13	18	9	12	6	58	....	....	....	....	....	......
25. Insanity	1	4	...	5	2	12	....	....	....	....	....	......
26. Measles	15	48	10	29	9	111	....	8	....	...	....	8
27. Mumps	7	11	....	6	1	25	....	....	....	....	....	......
28. Neuralgia	54	37	33	45	28	197	15	14	15	9	12	65
29. Peritonitis (non-puerperal)	5	2	1	2	3	13	1	1	...	1	2	5
30. Pneumonia	15	16	8	13	3	55	4	2	4	1	1	12
31. Pleurisy	5	5	3	10	....	23	....	....	1	....	....	1
32. Puerperal Fever	....	2	....	1	1	4	....	....	....	....	....	......
33. Rheumatism	17	16	13	21	13	80	6	15	7	8	11	47
34. Scarlatina	....	....	6	6	....	12	1	2	....	....	1	4
35. Small Pox	....	....	....	....	....	......	....	....	....	....	....	......
36. Syphilis	10	10	5	14	5	44	1	....	....	....	....	1
37. Tonsillitis	2	5	2	3	....	12	7	8	6	5	8	34
38. Tubercular Disease (other than pulmonary)	2	1	....	2	1	6	....	....	....	....	....	......
39. Whooping Cough	5	5	3	3	....	16	2	6	....	3	3	14
Total No. of Diseases	383	451	296	488	249	1867	169	168	133	118	146	734
Number of Reporters for each week and month	12	13	10	13	8	56	5	4	5	3	5	22
	Average No. of Reporters for the five weeks of June, 11·20.						Average No. of Reporters for the five weeks of June, 4·40.					

October, 1882, ending September 30th, 1883—*Continued.*

District No. VIII.						District No. IX.						District No. X.					
Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.
June 2nd.	June 9th.	June 16th.	June 23rd.	June 30th.		June 2nd.	June 9th.	June 16th.	June 23rd.	June 30th.		June 2nd.	June 9th.	June 16th.	June 23rd.	June 30th.	
1	...	1	1	2	5	....	....	1	1	3	5	....	1	2	4	2	9
3	2	3	8	9	25	3	6	3	15	5	32	13	13	27	24	20	97
....	1	3	5	3	12	....	2	2	1	2	7	5	5	3	9	6	28
....	....	....	....	....	....	2	....	....	....	1	3	6	3	2	2	2	15
....	....	....	3	1	4	2	3	1	1	2	9	....	....	4	3	1	8
....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1
10	18	11	13	16	68	7	9	1	6	3	26	13	11	18	13	16	71
....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	....	2
...	....	....	....	....	....	2	2	3	...	....	7	1	....	....	....	....	1
....	....	....	....	....	....	....	....	....	....	1	1	....	....	....	....	....	....
....	....	1	1	....	2	....	....	....	....	....	....	....	1	3	2	....	6
6	9	7	9	2	33	1	2	....	3	3	9	3	2	10	9	8	32
....	....	....	....	....	...	....	1	....	....	....	1	....	....	....	....	....	....
....	....	....	2	....	2	2	4	4	3	3	16	3	1	3	4	7	18
3	2	3	10	4	22	....	....	3	2	5	10	....	1	5	5	8	19
....	....	....	1	....	1	....	....	1	...	1	2	....	....	1	1	....	2
....	....	....	1	....	1	....	1	....	....	....	1	4	1	3	7	3	18
27	39	34	47	48	195	2	1	....	....	1	4	35	21	40	44	33	173
1	....	1	1	....	3	....	....	....	....	1	1	....	1	....	....	1	2
....	.	....	1	4	5	....	....	....	....	....	....	3	7	....	....	....	10
1	1	5	3	1	11	2	1	....	1	2	6	....	....	1	1	1	3
2	1	2	5	2	12	....	....	2	....	....	2	2	4	2	2	1	11
1	1	2	8	2	14	2	2	3	3	2	12	19	2	5	3	2	31
3	5	3	5	2	18	3	....	....	2	4	9	....	....	....	2	5	7
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	2	3
....	....	2	3	28	33	....	..	....	....	....	....	20	36	33	10	6	105
12	5	8	6	4	35	1	....	....	....	....	1	8	2	5	9	5	29
17	18	15	22	11	83	3	5	3	4	6	21	6	2	8	6	6	28
....	....	....	....	1	1	2	1	....	....	....	3	....	....	1	....	....	1
2	3	....	....	3	8	3	2	....	....	....	5	2	2	2	3	2	11
2	3	2	1	2	10	....	1	....	....	1	2	5	2	1	4	3	15
...	...	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
4	1	1	3	4	13	2	5	4	4	6	21	7	1	9	11	4	32
....	2	1	2	7	12	4	1	1	1	1	8	....	1	1	....	....	2
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	2	....	....	1	3	....	....	....	....	....	....	2	....	2	1	2	7
6	...	2	6	6	20	4	5	....	2	3	14	4	1	3	4	4	16
....	1	2	1	....	4	1	....	....	....	...	1	....	....	....	....	....	....
...	....	....	..	25	25	1	....	....	....	....	1	2	...	....	2	2	6
101	114	109	168	188	680	49	54	32	49	56	240	164	121	195	187	152	819
5	4	5	6	6	26	3	3	3	4	3	16	5	6	7	6	5	29

Average No. of Reporters for the five weeks of June, 5·20.

Average No. of Reporters for the five weeks of June, 3·20.

Average No. of Reporters for the five weeks of June, 5·80.

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. I. Number of Cases for week ending July 7th.	July 14th.	July 21st.	July 28th.	Total Cases for Month.	District No. II. Number of Cases for week ending July 7th.	July 14th.	July 21st.	July 28th.	Total Cases for Month.
1. Asthma (Spasmodic)	3	4	3	1	11	4	6	5	8	23
2. Anæmia	11	7	6	10	34	7	9	11	11	38
3. Accidents (Railroad, Machinery, etc.)	6	5	4	7	22	2	6	4	6	18
4. Blood Poisoning	3	1	....	2	6	....	....	....	....	....
5. Bright's Disease	....	....	....	....	....	....	2	1	3	6
6. Brain, Inflammation of	....	....	....	....	....	....	....	1	....	1
7. Bronchitis	7	11	5	2	25	1	3	2	7	13
8. Calculus	1	2	1	....	4	4	....	....	....	4
9. Cerebro-Spinal Meningitis	....	1	....	1	2	....	....	....	....	....
10. Cholera Infantum	6	6	4	3	19	4	4	7	9	24
11. Cholera Morbus	....	7	6	3	16	4	4	16	10	34
12. Consumption, Pulmonary	5	5	3	1	14	6	7	4	8	25
13. Croup, Membranous	....	....	....	....	....	....	....	4	1	5
14. Diphtheria	....	....	1	....	1	2	....	....	1	3
15. Diarrhœa	17	26	16	21	80	10	16	18	23	67
16. Dysentery	1	3	4	....	8	3	....	....	1	4
17. Erysipelas	1	1	....	1	3	2	3	7	6	18
18. Fever, Intermittent	....	1	....	1	2	15	10	17	16	58
19. Fever, Enteric	....	1	1	....	2	2	....	....	....	2
20. Fever, Typho-Malarial	....	....	....	....	....	3	....	....	1	4
21. Goitre	4	3	....	1	8	6	11	7	10	34
22. Gonorrhœa	2	5	....	2	9	4	3	4	5	16
23. Heart Disease, Organic	3	3	....	1	7	3	2	2	2	9
24. Influenza	....	1	....	....	1	7	8	8	10	33
25. Insanity	1	1	....	1	3	1	2	2	3	8
26. Measles	6	6	2	1	15	....	1	....	....	1
27. Mumps	....	2	....	2	4	1	3	1	....	5
28. Neuralgia	7	9	7	11	34	10	7	9	8	34
29. Peritonitis (non-puerperal)	1	2	2	1	6	1	....	1	....	2
30. Pneumonia	....	....	2	1	3	7	1	4	2	14
31. Pleurisy	3	4	1	1	9	3	....	1	....	4
32. Puerperal Fever	....	....	....	1	1	....	3	1	2	6
33. Rheumatism	9	6	2	7	24	9	5	10	10	34
34. Scarlatina	4	....	....	....	4	1	....	1	4	6
35. Small Pox	....	....	....	....	....	....	....	....	....	....
36. Syphilis	3	4	3	3	13	1	1	....	3	5
37. Tonsillitis	5	3	2	5	15	4	4	7	6	21
38. Tubercular Disease (other than pulmonary)	1	1	....	....	2	....	....	....	....	....
39. Whooping Cough	....	....	....	3	3	1	3	1	....	5
Total No. of Diseases	110	131	75	94	410	128	124	156	176	584
Number of Reporters for each week and month	6	6	4	5	21	7	7	6	7	27
	Average No. of Reporters for the four weeks of July, 5·25.					Average No. of Reporters for the four weeks of July, 6·75.				

October, 1882, ending September 30th, 1883.—*Continued.*

District No. III.					District No. IV.					District No. V.				
Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
July 7th.	July 14th.	July 21st.	July 28th.		July 7th.	July 14th.	July 21st.	July 28th.		July 7th.	July 14th.	July 21st.	July 28th.	
......	1	......	2	3	9	9	10	10	38	......	3	2	4	9
2	2	2	2	8	51	22	39	64	176	10	15	10	16	51
......	......	8	8	16	17	13	24	18	72	8	8	8	13	37
......	......	......	1	1	3	1	2	......	6	......	......	......	1	1
......	......	1	......	1	2	8	5	7	22	3	2	3	3	11
......	......	......	......	......	1	1	3	......	5	......	......	......	1	1
2	......	6	6	14	30	24	29	44	127	5	6	8	11	30
......	......	......	......	......	4	......	......	1	5	......	......	......	1	1
......	......	......	......	......	2	1	1	......	4	......	......	......	......	......
......	......	......	......	......	8	3	21	42	74	......	5	......	12	17
......	......	......	......	......	9	6	10	24	49	......	2	1	3	6
......	2	......	2	4	26	20	33	24	103	6	9	6	9	30
......	......	......	......	......	1	......	......	10	11	......	......	......	......	......
......	......	3	......	3	4	......	5	15	24	......	......	......	1	1
1	4	25	29	59	37	28	62	104	231	3	13	9	29	54
......	......	8	7	15	4	2	7	12	25	......	3	1	4	8
......	1	4	......	5	4	7	5	9	25	......	1	1	3	5
......	1	8	6	15	16	19	19	29	83	1	7	3	11	22
......	......	4	2	6	7	1	2	5	15	2	1	1	3	7
3	1	4	2	10	5	1	7	10	23	......	1	......	3	4
2	......	2	1	5	8	4	7	7	26	4	8	4	7	23
......	2	4	2	8	10	6	6	13	35	......	......	......	1	1
......	......	......	......	......	22	24	18	17	81	2	2	2	4	10
......	......	30	11	41	11	5	5	16	37	1	2	..	2	5
......	......	......	......	......	4	2	5	4	15	1	1	......	1	3
......	......	......	......	......	16	11	5	11	43	......	......	......	3	3
......	......	......	......	......	3	2	2	3	10	......	4	1	4	9
......	......	5	10	15	46	47	29	38	160	13	16	13	16	58
......	......	......	......	......	4	5	4	10	23	1	1	......	......	2
......	......	......	......	......	13	14	17	9	53	1	......	1	2	4
......	......	1	......	1	3	1	3	2	9	2	1	1	4	8
......	......	......	2	2	4	3	3	1	11	......	......	......	1	1
......	......	10	12	22	29	28	26	26	109	3	9	7	11	30
......	2	......	......	2	12	8	7	2	29	......	......	......	1	1
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
......	......	......	4	4	10	6	6	6	28	7	7	7	9	30
......	......	2	......	2	9	4	10	13	36	3	2	2	2	9
......	......	......	......	......	3	5	1	7	16	1	2	1	2	6
10	4	20	9	43	5	3	13	18	39	2	2	3	1	8
20	20	147	118	305	452	344	451	631	1878	79	133	95	199	506
1	1	2	3	7	16	12	13	16	57	3	4	3	4	14
Average No. of Reporters for the four weeks of July, 1·75.					Average No. of Reporters for the four weeks of July, 14·25.					Average No. of Reporters for the four weeks of July, 3·50.				

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. VI. Number of Cases for week ending July 7th.	July 14th.	July 21st.	July 28th.	District No. VI. Total Cases for Month.	District No. VII. Number of Cases for week ending July 7th.	July 14th.	July 21st.	July 28th.	District No. VII. Total Cases for Month.
1. Asthma (Spasmodic)	9	19	13	8	49	4	1	2	....	7
2. Anæmia	56	73	49	49	227	20	7	11	14	52
3. Accidents (Railroad, Machinery, etc.)	26	30	26	16	98	....	4	2	....	6
4. Blood Poisoning	3	4	2	4	13	....	....	1	....	1
5. Bright's Disease	6	6	4	4	20	1	....	....	..	1
6. Brain, Inflammation of	2	2	....	2	6	....	....	....	....	.....
7. Bronchitis	21	42	33	32	128	12	8	7	14	41
8. Calculus	3	3	1	6	13	...	...	....	....	.....
9. Cerebro-Spinal Meningitis	4	2	....	2	8	....	...	...	....	.....
10. Cholera Infantum	14	16	17	19	66	....	1	....	2	3
11. Cholera Morbus	14	5	15	14	48	1	....	2	11	14
12. Consumption, Pulmonary	21	23	18	21	83	8	7	7	5	27
13. Croup, Membranous	2	2	1	2	7	...	...	...	...	.....
14. Diphtheria	14	27	10	12	63	1	3	1	1	6
15. Diarrhœa	35	52	61	71	219	9	8	14	20	51
16. Dysentery	6	7	8	12	33	1	1	....	1	3
17. Erysipelas	5	7	2	3	17	1	1	....	1	3
18. Fever, Intermittent	17	18	24	25	84	34	26	36	30	126
19. Fever, Enteric	5	4	4	10	23	...	....	....	....	.....
20. Fever, Typho-Malarial	2	2	5	3	12	1	....	....	....	1
21. Goitre	14	16	8	5	43	...	....	....	1	1
22. Gonorrhœa	9	10	7	11	37	....	....	....	1	1
23. Heart Disease, Organic	21	22	18	18	79	6	5	3	3	17
24. Influenza	6	10	....	6	22	....	....	....	....	.....
25. Insanity	6	8	4	5	23	....	....	1	....	1
26. Measles	9	18	7	11	45	....	....	....	....	.....
27. Mumps	8	2	7	2	19	....	....	....	....	.....
28. Neuralgia	28	37	34	33	132	14	5	12	8	39
29. Peritonitis (non-puerperal)	3	5	5	5	18	1	2	....	1	4
30. Pneumonia	9	6	6	6	27	1	....	....	....	1
31. Pleurisy	3	4	2	5	14	....	....	....	....	.....
32. Puerperal Fever	1	....	....	....	1	....	6	....	...	6
33. Rheumatism	15	26	19	19	79	7	....	10	5	22
34. Scarlatina	....	7	2	4	13	1	....	....	1	2
35. Small Pox	..	....	....	....	.....	....	....	....	...	.....
36. Syphilis	3	9	13	10	35	1	1	....	....	2
37. Tonsillitis	3	10	8	8	29	4	4	4	6	18
38. Tubercular Diseases (other than pulmonary)	1	4	3	5	13	....	....	....	....	.....
39. Whooping Cough	2	2	3	2	9	3	....	....	....	3
Total No. of Diseases	406	540	439	470	1855	131	90	113	125	459
Number of Reporters for each week and month	11	13	12	13	49	5	4	4	3	16
	Average No. of Reporters for the four weeks of July, 12·25.					Average No. of Reporters for the four weeks of July, 4·00.				

October, 1882, ending September 30, 1883—*Continued.*

District No. VIII.					District No. IX.					District No. X.				
Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
July 7th.	July 14th.	July 21st.	July 28th.		July 7th.	July 14th.	July 21st.	July 28th.		July 7th.	July 14th.	July 21st.	July 28th.	
3	1	3	3	10	4	3	3	2	12	3	5	13	.....	21
3	8	7	6	24	7	5	5	6	25	18	8	19	6	51
5	3	3	.....	11	1	6	3	4	14	5	8	3	.....	16
.....	.....	.....	.....	.....	2	2	1	.....	5	1	1	1	1	4
.....	1	1	.....	2	3	1	2	3	9	4	2	1	.....	7
.....	.....	.....	.....	.....	.....	1	.....	.....	1	1	1	3	.....	5
32	.....	18	12	62	5	6	3	11	25	8	6	10	4	28
1	.....	1	1	3	.....	.....	.....	.....	.....	.....	1	1	1	3
.....	.....	.....	.....	.....	1	.....	.....	.....	1	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	1	3	4	.....	.....	.....	.....	.....
.....	.....	2	.....	2	.....	2	1	2	5	.....	.....	1	1	2
2	5	2	3	12	4	3	3	4	14	8	11	9	2	30
.....	.....	.....	.....	.....	.....	.....	1	2	3	.....	.....	.....	.....	.....
1	.....	.....	.....	1	5	6	9	8	28	8	4	.....	1	13
3	1	7	16	27	2	8	8	11	29	8	9	6	9	32
.....	.....	.....	.....	.....	3	1	2	3	9	.....	.....	2	1	3
2	.....	1	.....	3	2	.....	.....	1	3	6	4	3	3	16
52	39	46	45	182	1	2	2	1	6	46	57	37	19	159
.....	.....	.....	.....	.....	1	2	1	.....	4	.....	.....	2	4	6
.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1	.....	1
.....	1	.....	.....	1	2	1	1	2	6	1	2	4	2	9
3	2	.....	3	8	.....	.....	.....	.....	.....	1	3	4	2	10
1	.....	.....	1	2	1	1	3	3	8	2	1	4	.....	7
6	.....	4	4	14	2	1	.....	1	4	2	2	.....	2	6
.....	.....	.....	.....	.....	2	.....	1	2	5	.....	.....	.....	1	1
7	12	8	.....	27	.....	.....	.....	.....	.....	2	9	4	3	18
1	2	.....	.....	3	.....	.....	.....	1	1	4	3	4	1	12
5	8	10	13	36	6	6	5	6	23	9	11	8	7	35
.....	.....	.....	.....	.....	1	.....	.....	1	2	1	1	.....	.....	2
2	3	.....	1	6	1	1	1	1	4	.....	2	2	1	5
.....	1	.....	.....	1	1	1	2	2	6	3	3	.....	.....	6
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4	3	3	1	11	3	4	2	2	11	7	6	5	5	23
1	1	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	2	2
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	1	.....	.....	1	.....	.....	.....	.....	.....	1	1	1	1	4
4	1	1	2	8	3	2	2	4	11	5	2	1	2	10
1	1	.....	.....	2	.....	2	2	1	5	.....	2	2	.....	4
40	5	50	36	131	.....	.....	.....	.....	.....	2	.....	.....	1	3
179	100	167	147	593	63	67	64	87	281	156	165	151	82	554
5	3	5	5	18	4	3	4	5	16	6	7	6	5	24
Average No. of Reporters for the four weeks of July, 4·50.					Average No. of Reporters for the four weeks of July, 4·00.					Average No. of Reporters for the four weeks of July, 6·00.				

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. I.					District No. II.				
	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
	Aug. 4th.	Aug. 11th.	Aug. 18th.	Aug. 25th.		Aug. 4th.	Aug. 11th.	Aug. 18th.	Aug. 25th.	
1. Asthma (Spasmodic)	1	1	2	1	5	6	3	7	8	24
2. Anæmia	8	5	8	2	23	12	12	9	14	47
3. Accidents (Railroad, Machinery, etc.)	4	2	8	1	15	2	2	2	1	7
4. Blood Poisoning	1	....	1	1	3	....	....	....	....	....
5. Bright's Disease	....	1	....	....	1	2	5	2	2	11
6. Brain, Inflammation of	....	....	....	....	....	....	1	1	....	2
7. Bronchitis	6	2	7	7	22	9	10	8	9	36
8. Calculus	....	....	1	....	1	2	1	....	2	5
9. Cerebro-Spinal Meningitis	....	....	6	....	6	....	....	....	....	....
10. Cholera Infantum	1	...	8	5	14	4	8	14	17	43
11. Cholera Morbus	5	2	5	2	14	7	5	3	12	27
12. Consumption, Pulmonary	1	1	2	5	9	7	7	12	5	31
13. Croup, Membranous	....	....	....	....	....	....	....	....	....	....
14. Diphtheria	....	....	....	1	1	1	....	....	....	1
15. Diarrhœa	22	12	20	13	67	17	24	16	24	81
16. Dysentery	5	6	4	3	18	2	8	1	10	21
17. Erpsipelas	....	....	....	....	....	1	....	3	3	7
18. Fever, Intermittent	....	....	1	....	1	4	8	6	12	30
19. Fever, Enteric	....	1	5	7	13	1	1	2	4	8
20. Fever, Typho-Malarial	....	....	....	....	....	....	2	2	....	4
21. Goitre	1	....	....	....	1	9	7	8	8	32
22. Gonorrhœa	2	1	1	2	6	2	1	3	1	7
23. Heart Disease, Organic	2	....	1	1	4	....	2	1	3	6
24. Influenza	2	....	2	....	4	5	3	3	5	16
25. Insanity	1	1	2	2	6	....	....	1	....	1
26. Measles	....	....	....	....	....	6	3	....	....	9
27. Mumps	....	....	....	....	....	....	....	1	....	1
28. Neuralgia	9	2	6	1	18	11	10	8	11	40
29. Peritonitis (non-puerperal)	1	....	2	2	5	1	1	1	....	3
30. Pneumonia	....	....	....	....	....	1	2	1	2	6
31. Pleurisy	2	....	3	1	6	....	....	1	....	1
32. Puerperal Fever	....	....	....	....	....	1	1	....	1	3
33. Rheumatism	4	2	5	3	14	9	9	6	9	33
34. Scarlatina	....	....	....	....	....	5	4	3	....	12
35. Small Pox	....	....	....	....	....	....	....	....	....	....
36. Syphilis	....	....	....	1	1	2	....	1	....	3
37. Tonsillitis	1	1	4	2	8	5	1	3	2	11
38. Tubercular Disease (other than pulmonary)	....	....	3	....	3	1	....	....	....	1
39. Whooping Cough	....	....	....	....	....	....	....	....	....	....
Total No. of Diseases	79	40	107	63	289	135	141	129	165	570
Number of Reporters for each week and month	4	3	5	3	15	5	6	5	6	22
	Average No. of Reporters for the four weeks of August, 3·75.					Average No. of Reporters for the four weeks of August, 5.50.				

October, 1882, ending September 30th, 1883—*Continued.*

District No. III.					District No. IV.					District No. V.				
Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
Aug. 4th.	Aug. 11th.	Aug. 18th.	Aug. 25th.		Aug. 4th.	Aug. 11th.	Aug. 18th.	Aug. 25th.		Aug. 4th.	Aug. 11th.	Aug. 18th.	Aug. 25th.	
2	2	1	.....	5	14	6	13	11	44	3	.....	3	1	7
2	.....	2	4	8	48	43	50	43	184	11	.....	9	7	27
10	1	.....	3	14	10	13	13	22	58	3	4	4	6	17
.....	.....	.....	.....	.....	.....	.....	4	1	5	.....	.....	.....	1	1
.....	.....	.....	.....	.....	6	2	6	3	17	3	.....	2	2	7
.....	.....	.....	.....	.....	.....	.....	3	2	5	.....	.....	1	1	2
3	5	3	2	13	20	28	28	34	110	3	3	9	17	32
.....	.....	.....	.....	.....	1	2	4	3	10	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	1	.....	.....	.....	1	.....	.....	.....	.....	.....
1	2	3	4	10	18	26	24	30	98	.....	1	1	5	7
.....	.....	2	.....	2	6	9	5	10	30	.....	3	3	4	10
.....	.....	.....	.....	.....	18	19	24	25	86	5	.....	6	5	16
.....	.....	.....	.....	.....	.....	2	.....	2	4	.....	.....	.....	1	1
.....	.....	.....	.....	.....	4	5	5	8	22	.....	3	2	1	6
27	12	12	16	67	96	90	95	90	371	3	1	6	11	21
3	5	5	2	15	10	21	11	19	61	.....	.....	.....	.....	.....
1	1	1	3	6	8	4	7	4	23	.....	1	1	2	4
6	5	4	4	19	21	21	18	27	87	1	4	5	3	13
3	.....	.....	.....	3	3	8	12	15	38	2	.....	1	2	5
.....	.....	.....	.....	.....	7	7	6	6	26	.....	.....	4	4	8
3	.....	.....	.....	3	3	7	2	7	19	3	1	6	5	15
.....	.....	.....	2	2	6	14	6	6	32	1	.....	.....	.....	1
.....	2	2	.....	4	13	13	24	24	74	2	1	3	5	11
.....	.....	.....	.....	.....	5	5	.....	2	12	.....	.....	.....	6	6
.....	.....	.....	.....	.....	1	2	2	4	9	1	.....	.....	.....	1
.....	.....	.....	.....	.....	2	2	2	.....	6	.....	.....	.....	.....	.....
.....	3	.....	1	4	3	4	5	2	14	.....	.....	.....	.....	.....
8	.....	1	.....	9	19	25	32	35	111	12	.....	12	13	37
.....	.....	.....	.....	.....	3	4	3	5	15	1	.....	2	1	4
.....	.....	.....	.....	.....	14	11	11	17	53	.....	.....	.....	1	1
1	.....	.....	.....	1	5	2	3	4	14	1	1	1	1	4
.....	1	.....	.....	1	.....	.....	.....	2	2	.....	.....	.....	.....	.....
11	3	1	2	17	21	28	13	20	82	2	.....	7	12	21
.....	.....	3	.....	3	4	.....	2	12	18	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	5	6	3	8	22	6	.....	6	7	19
2	.....	.....	.....	2	2	5	9	7	23	2	2	2	1	7
.....	.....	.....	.....	.....	4	2	5	7	18	1	1	3	2	7
5	14	20	25	64	.....	2	9	5	16	3	.....	.....	2	5
88	56	60	68	272	401	438	459	522	1820	69	26	99	129	323
3	2	2	3	10	12	13	12	14	51	1	2	3	4	10
Average No. of Reporters for the four weeks of August, 2·50.					Average No. of Reporters for the four weeks of August, 12·75.					Average No. of Reporters for the four weeks of August, 2·50.				

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. VI.					District No. VII.				
	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
	Aug. 4th.	Aug. 11th.	Aug. 18th.	Aug. 25th.		Aug. 4th.	Aug. 11th.	Aug. 18th.	Aug. 25th.	
1. Asthma (Spasmodic)	12	12	9	11	44	4	....	1	1	6
2. Anæmia	57	48	53	58	216	19	10	13	9	51
3. Accidents (Railroad, Machinery, etc.)	26	26	26	24	102	...	2	2	....	4
4. Blood Poisoning	4	1	2	1	8	1	1	1	2	5
5. Bright's Disease	5	5	4	2	16	....	....	....	....	......
6. Brain, Inflammation of	2	1	4	....	7	....	...	....	....	.....
7. Bronchitis	32	37	26	18	113	14	8	7	8	37
8. Calculus	3	2	....	1	6	.. .	....	....	....	......
9. Cerebro-Spinal Meningitis	2	....	....	....	2	....	....	....	....	....
10. Cholera Infantum	33	30	27	52	142	5	1	3	3	12
11. Cholera Morbus	15	10	20	25	70	10	9	13	4	36
12. Consumption, Pulmonary	19	18	15	16	68	7	8	8	7	30
13. Croup, Membranous	2	1	....	....	3	...	....	....	...	....
14. Diphtheria	7	6	8	4	25	....	....	1	....	1
15. Diarrhœa	63	63	74	85	285	32	21	23	17	93
16. Dysentery	9	5	17	20	51	1	....	7	2	10
17. Erysipelas	5	2	6	4	17	....	1	....	...	1
18. Fever, Intermittent	21	14	11	30	76	49	25	45	18	137
19. Fever, Enteric	12	4	14	15	45	....	....	....	1	1
20. Fever, Typho-Malarial	8	2	5	5	20	....	....	1	....	1
21. Goitre	7	7	3	3	20	...	1	....	2	3
22. Gonorrhœa	7	4	9	10	30	1	....	1	1	3
23. Heart Disease, Organic	14	18	16	17	65	3	5	4	4	16
24. Influenza	11	10	4	5	30	2	1	....	2	5
25. Insanity	3	3	3	6	15	....	....	1	....	1
26. Measles	3	....	....	2	5	....	.. .	....	....	... ..
27. Mumps	....	4	2	1	7	....	....	....	....	......
28. Neuralgia	42	24	28	33	127	13	8	13	10	44
29. Peritonitis (non-puerperal)	4	2	3	4	13	.. .	...	1	....	1
30. Pneumonia	8	5	4	3	20	1	1	1	....	3
31. Pleurisy	8	3	3	....	14	....	....	....	....	... ..
32. Puerperal Fever	....	....	....	....	....	....	....	....	....	......
33. Rheumatism	20	10	9	7	46	7	7	7	3	24
34. Scarlatina	1	6	1	3	11	..	....	...	....	.. .
35. Small Pox	....	....	....	....	......	....	....	....	....	......
36. Syphilis	3	3	2	3	11	....	...	....	....	... .
37. Tonsillitis	7	8	8	5	28	2	2	5	7	16
38. Tubercular Disease (other than pulmonary)	2	6	1	3	12	....	....	....	....	......
39. Whooping Cough	7	4	....	....	11	....	....	....	...	......
Total No. of Diseases	484	404	417	476	1781	171	111	158	101	541
Number of Reporters for each week and month	12	11	11	11	45	5	4	5	3	17
	Average No. of Reporters for the four weeks of August, 11·25.					Average No. of Reporters for the four weeks of August, 4·25.				

October, 1882, ending September 30th, 1883—*Continued.*

District No. VIII.					District No. IX.					District No. X.				
Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.	Number of Cases for week ending				Total Cases for Month.
Aug. 4th.	Aug. 11th.	Aug. 18th.	Aug. 25th.		Aug. 4th.	Aug. 11th.	Aug. 18th.	Aug. 25th.		Aug. 4th.	Aug. 11th.	Aug. 18th.	Aug. 25th.	
2	1	1	1	5	3	2	......	1	6	2	4	6	3	15
11	7	7	5	30	8	6	5	9	28	16	15	15	8	54
6	3	4	3	16	1	1	2	2	6	4	8	5	9	26
......	......	1	......	1	1	1	......	......	2	......	......	......	......	......
1	......	......	1	2	1	1	1	2	5	1	......	1	1	3
......	......	......	......	......	......	......	......	......	......	11	......	1	1	13
13	19	12	12	56	17	10	7	8	42	2	10	14	8	34
2	......	1	1	4	......	......	......	......	......	......	1	1	1	3
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
......	1	1	2	4	......	3	1	1	5	1	6	1	9	17
1	2	2	1	6	......	3	1	......	4	11	6	5	11	33
5	4	5	5	19	4	1	4	7	16	10	11	11	2	34
......	......	......	......	......	2	......	......	......	2	......	......	......	1	1
......	5	......	1	6	3	......	......	......	3	......	......	......	2	2
15	33	27	18	93	11	14	12	31	68	25	31	20	36	112
1	1	1	5	8	3	3	3	4	13	11	11	9	5	36
1	2	1	......	4	......	......	1	......	1	1	2	......	......	3
44	51	36	36	167	2	1	1	......	4	36	42	43	47	168
2	2	2	......	6	......	1	4	2	7	1	......	1	4	6
3	......	......	......	3	......	......	......	1	1	1	3	4	3	11
1	1	......	1	3	6	3	2	3	14	1	......	......	1	2
5	4	4	3	16	......	2	2	......	4	4	1	3	3	11
3	4	1	2	10	4	1	2	......	7	2	2	3	3	10
6	5	2	6	19	......	......	......	1	1	......	1	1	......	2
......	1	1	......	2	......	......	......	......	......	......	1	1	1	3
......	......	3	7	10	......	......	......	1	1	3	1	2	1	7
6	......	......	2	8	......	......	......	......	......	3	6	3	......	12
14	12	15	8	49	7	9	4	8	28	6	2	4	10	22
......	......	......	......	......	2	......	1	......	3	2	......	2	2	6
1	1	1	......	3	1	3	4	4	12	1	1	3	......	5
......	......	......	......	......	1	1	3	3	8	......	......	1	1	2
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
9	5	2	2	18	5	1	4	2	12	2	3	3	3	11
......	......	......	......	......	......	......	......	......	......	......	......	......	2	2
......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
1	1	......	......	2	......	......	......	......	......	......	......	......	1	1
7	2	5	16	30	6	1	2	3	12	1	......	1	2	4
1	......	2	......	3	......	......	......	......	......	1	......	......	......	1
32	28	......	6	66	......	......	......	......	......	1	2	......	......	3
193	195	137	144	669	88	68	66	93	315	160	170	164	181	675
6	6	5	5	22	5	4	4	4	17	7	5	6	7	25
Average No. of Reporters for the four weeks of August, 5·50.					Average No. of Reporters for the four weeks of August, 4·25.					Average No. of Reporters for the four weeks of August, 6·25.				

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. I.						District No. II.					
	Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.
	Sept. 1st.	Sept. 8th.	Sept. 15th	Sept. 22nd	Sept. 29th		Sept. 1st.	Sept. 8th.	Sept. 15th	Sept. 22nd	Sept. 29th	
1. Asthma (Spasmodic)	2	1	5	....	....	8	3	4	4	2	5	18
2. Anæmia	7	3	9	11	4	34	10	12	11	11	8	52
3. Accidents (Railroad, Machinery, etc.)	8	2	3	4	4	21	3	2	2	3	3	13
4. Blood Poisoning	2	1	....	1	....	4	....	....	....	....	....	.....
5. Bright's Disease	....	....	....	....	....	.....	....	....	....	1	2	3
6. Brain, Inflammation of	....	....	1	....	....	1	....	....	....	....	....	.....
7. Bronchitis	6	9	4	9	5	33	4	7	9	14	10	44
8. Calculus	1	....	1	....	....	2	....	2	2	1	....	5
9. Cerebro-Spinal Meningitis	....	....	1	....	....	1	....	....	....	....	....	.....
10. Cholera Infantum	9	3	6	3	1	22	13	9	10	10	4	46
11. Cholera Morbus	2	3	....	4	1	10	6	3	5	5	5	24
12. Consumption, Pulmonary	2	1	3	2	....	8	3	3	4	5	7	22
13. Croup, Membranous	2	....	....	....	1	3	....	1	....	1	....	2
14. Diphtheria	3	....	3	....	1	7	....	....	....	....	3	3
15. Diarrhœa	25	14	13	16	8	76	16	14	12	13	12	67
16. Dysentery	3	....	1	....	....	4	3	4	6	6	2	21
17. Erysipelas	....	....	1	1	1	3	1	1	1	4	3	10
18. Fever, Intermittent	....	....	1	....	....	1	5	4	7	16	12	44
19. Fever, Enteric	9	5	3	3	....	20	1	2	3	1	7	14
20. Fever, Typho-Malarial	....	....	....	....	....	.....	1	2	1	1	2	7
21. Goitre	....	....	1	....	....	1	3	5	4	6	10	28
22. Gonorrhœa	3	....	1	1	7	12	2	1	3	3	2	11
23. Heart Disease, Organic	5	4	5	3	4	21	1	....	3	4	4	12
24. Influenza	2	2	3	7	6	20	....	3	....	7	5	15
25. Insanity	1	....	1	1	....	3	....	....	....	....	1	1
26. Measles	....	....	....	....	....	.....	....	....	....	....	3	3
27. Mumps	....	....	....	....	....	.....	....	....	....	....	3	3
28. Neuralgia	9	5	12	7	7	40	8	6	11	13	5	43
29. Peritonitis (non-puerperal)	2	....	2	....	....	4	1	....	1	....	1	3
30. Pneumonia	....	....	1	1	....	2	1	1	1	....	2	5
31. Pleurisy	1	1	1	....	....	3	....	....	....	3	1	4
32. Puerperal Fever	....	....	....	1	....	1	....	....	....	....	....	.....
33. Rheumatism	5	2	7	5	2	21	5	8	11	7	5	36
34. Scarlatina	1	....	....	....	....	1	....	....	....	....	3	3
35. Small Pox	....	....	....	....	....	.....	....	....	....	....	....	.....
36. Syphilis	3	....	2	....	....	5	....	1	1	1	1	4
37. Tonsillitis	5	1	4	3	3	16	3	1	3	5	3	15
38. Tubercular Disease (other than pulmonary)	2	1	1	....	1	5	....	....	....	....	2	2
39. Whooping Cough	4	....	3	....	....	7	....	....	....	....	....	.....
Total No. of Diseases	124	58	99	83	56	420	93	96	115	143	136	583
Number of Reporters for each week and month	5	3	5	4	3	20	4	4	4	6	6	24
	Average No. of Reporters for the five weeks of September, 4·00.						Average No. of Reporters for the five weeks of September, 4·80.					

October 1882, ending September 30th, 1883—*Continued.*

District No. III.						District No. IV.						District No. V.					
Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.
Sept. 1st.	Sept. 8th.	Sept. 15th	Sept. 22nd	Sept. 29th		Sept. 1st.	Sept. 8th.	Sept. 15th	Sept. 22nd	Sept. 29th		Sept. 1st.	Sept. 8th.	Sept. 15th	Sept. 22nd	Sept. 29th	
....	1	....	....	2	3	9	11	6	4	9	39	....	....	2	....	....	2
2	....	6	4	5	17	45	40	25	20	53	183	....	2	4	7	9	22
....	1	2	....	3	6	11	17	17	16	18	79	2	5	3	10	7	27
....	....	....	....	....	....	2	2	1	1	1	7	....	....	....	....	....	....
....	....	....	....	....	....	6	6	6	1	9	28	....	....	....	2	2	4
....	1	....	....	....	1	....	1	....	2	1	4	....	....	....	....	....	....
....	....	3	4	....	7	27	31	31	31	62	182	1	....	6	12	7	26
....	....	....	....	....	....	1	2	....	....	1	4	....	....	....	....	....	....
....	....	....	1	....	1	....	1	....	1	1	3	....	....	....	....	....	....
4	....	6	7	....	17	30	17	5	3	11	66	1	....	4	5	2	12
....	....	6	....	2	8	6	4	4	1	10	25	....	....	3	....	1	4
2	1	....	2	....	5	19	25	20	17	33	114	....	....	1	4	4	9
....	....	....	....	....	....	1	....	1	....	1	3	....	....	2	1	....	3
....	....	2	....	....	2	7	3	1	....	6	17	....	....	1	....	....	1
15	12	23	17	9	76	79	50	42	21	43	235	4	2	5	3	6	20
....	3	7	6	2	18	13	9	6	6	13	47	1	2	3	1	1	8
....	1	....	....	1	2	7	5	3	4	5	24	2	....	....	2	1	5
....	....	....	....	....	....	25	11	12	10	22	80	....	....	4	3	3	10
....	....	2	1	2	5	17	21	20	16	22	96	....	....	....	3	3	6
....	....	2	....	..	2	4	9	3	....	14	30	....	....	1	1	1	3
....	2	2	....	3	7	3	3	....	1	10	17	1	1	2	5	4	13
....	1	....	....	1	2	10	....	7	5	11	33	....	....	....	....	1	1
....	....	....	....	1	1	14	17	18	12	19	80	....	....	....	4	4	8
....	....	....	....	4	4	10	6	34	18	54	122	....	....	....	7	3	10
....	....	....	....	....	....	1	....	2	1	4	8	....	....	....	2	2	4
....	....	1	2	....	3	....	....	2	1	1	4	....	....	....	....	....	....
....	....	....	....	....	....	....	1	....	....	6	7	....	....	....	....	....	....
3	2	4	5	3	17	36	32	17	22	59	166	2	1	3	15	10	31
....	....	....	....	....	....	2	3	5	3	1	14	....	....	1	....	....	1
....	....	....	....	....	....	9	11	10	10	22	62	....	....	3	2	....	5
....	....	....	....	1	1	3	5	2	....	9	19	....	....	....	1	1	2
....	....	1	....	....	1	....	1	1	1	1	4	....	....	1	1	....	2
2	1	2	2	3	10	21	19	15	4	25	84	....	....	20	6	5	31
....	....	....	....	....	....	3	22	12	....	2	39	....	....	....	1	....	1
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	7	3	9	8	15	42	....	....	....	7	8	15
....	....	....	....	....	....	5	14	8	2	8	37	1	3	2	4	4	14
....	....	....	....	....	....	9	7	2	3	8	29	....	....	....	1	1	2
4	3	4	4	3	18	4	4	5	....	....	13	....	....	....	2	3	5
32	29	73	55	45	234	446	413	352	245	590	2046	15	16	71	112	93	307
1	1	2	2	2	8	11	11	11	10	14	57	2	2	3	4	3	14
Average No. of Reporters for the five weeks of September, 1·60.						Average No. of Reporters for the five weeks of September, 11·40.						Average No. of Reporters for the five weeks of September, 2·80.					

TABLE I.—Weekly Report of Diseases in Ontario for the year beginning

DISEASES.	District No. VI. Number of Cases for week ending Sept. 1st.	Sept. 8th.	Sept. 15th	Sept. 22nd	Sept. 29th	District No. VI. Total Cases for Month.	District No. VII. Number of Cases for week ending Sept. 1st.	Sept. 8th.	Sept. 15th	Sept. 22nd	Sept. 29th	District No. VII. Total Cases for Month.
1. Asthma (Spasmodic)	18	7	11	12	14	62	1	2	2	3	1	9
2. Anæmia	43	50	37	31	35	196	12	13	14	13	8	60
3. Accidents (Railroad, Machinery, etc.)	20	16	23	24	25	108	....	3	8	6	5	22
4. Blood Poisoning	1	2	1	3	1	8	1	....	....	...	1	2
5. Bright's Disease	6	2	4	3	4	19	....	....	2	1	1	4
6. Brain, Inflammation of	1	3	1	1	2	8	1	....	....	....	....	1
7. Bronchitis	23	23	13	30	31	120	12	9	14	22	14	71
8. Calculus	1	1	2	....	...	4	....	...	....	....	....	.....
9. Cerebro-Spinal Meningitis	....	...	....	....	....	.....	....	....	....	....	....	.....
10. Cholera Infantum	57	23	16	38	10	144	4	3	....	3	2	12
11. Cholera Morbus	46	15	11	11	6	89	1	2	1	3	3	10
12. Consumption, Pulmonary	22	13	9	21	14	79	7	8	8	6	5	34
13. Croup, Membranous	6	....	....	2	6	14	....	....	....	....	....	... .
14. Diphtheria	10	2	10	13	13	48	....	....	2	1	....	3
15. Diarrhœa	94	41	31	32	31	229	18	17	19	14	14	82
16. Dysentery	40	20	9	15	6	90	1	1	5	4	3	14
17. Erysipelas	3	....	1	1	5	10	....	....	....	1	....	1
18. Fever, Intermittent	20	17	29	36	14	116	23	23	25	28	37	136
19. Fever, Enteric	16	14	18	14	25	87	1	....	....	....	...	1
20. Fever, Typho-Malarial	8	4	11	13	3	39	....	....	....	....	....	.....
21. Goitre	6	1	2	4	4	17	....	....	1	1	1	3
22. Gonorrhœa	14	7	15	10	13	59	1	2	2	2	....	7
23. Heart Disease, Organic	20	13	13	14	15	75	3	3	4	3	3	16
24. Influenza	18	10	6	7	27	68	....	3	2	6	5	16
25. Insanity	4	4	2	1	5	16	....	....	....	....	....	.....
26. Measles	15	....	..	2	11	28	....	....	...	....	....	.....
27. Mumps	2	1	1	4	1	9	....	.. .	....	....	....	.....
28. Neuralgia	32	31	26	28	20	137	7	8	8	9	6	38
29. Peritonitis (non-puerperal)	9	6	4	5	2	26	....	....	2	2	....	4
30. Pneumonia	3	4	1	5	10	23	....	....	. ..	....	1	1
31. Pleurisy	6	2	....	1	4	13	....	....	....	...	....	.....
32. Puerperal Fever	1	2	1	....	...	4	....	....	....	....	....	.....
33. Rheumatism	20	11	12	12	20	75	4	6	5	8	7	30
34. Scarlatina	7	3	6	9	6	31	.. .	....	3	1	....	4
35. Small Pox	....	....	....	....	....	.. . .	....	....	....	....	....	.....
36. Syphilis	3	6	2	7	1	19	....	....	1	1	1	3
37. Tonsillitis	11	7	6	13	15	52	6	8	8	6	7	35
38. Tubercular Disease (other than pulmonary)	2	5	1	3	3	14	....	....	....	....	....	.....
39. Whooping Cough	...	....	....	27	8	35	....	....	...	....	....	.. ...
Total No. of Diseases	608	366	335	452	410	2171	103	111	136	144	125	619
Number of Reporters for each week and month	13	10	9	11	11	54	3	3	3	3	3	15
	Average No. of Reporters for the five weeks of September, 10·80.						Average No. of Reporters for the five weeks of September, 3·00.					

October 1882, ending September 30th, 1883—*Continued.*

District No. VIII.						District No. IX.						District No. X.					
Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.	Number of Cases for week ending					Total Cases for Month.
Sept. 1st.	Sept. 8th.	Sept. 15th	Sept. 22nd	Sept. 29th		Sept. 1st.	Sept. 8th.	Sept. 15th	Sept. 22nd	Sept. 29th		Sept. 1st.	Sept. 8th.	Sept. 15th	Sept. 22nd	Sept. 29th	
....	1	1	....	2	4	3	2	4	3	3	15	5	6	6	3	1	21
11	1	4	1	5	22	9	2	5	3	6	25	9	11	14	17	15	66
2	....	1	1	1	5	2	....	1	....	1	4	5	5	6	12	6	34
1	....	....	....	1	2	....	2	1	1	1	5	....	1	3	1	2	7
1	1	1	....	2	5	3	1	1	3	3	11	1	1	....	2	....	4
....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1
9	13	20	7	15	64	6	2	5	1	4	18	11	14	12	17	13	67
1	1	....	....	....	2	....	1	....	....	1	2	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	1	....	1	....	1	....	....	....	1
3	....	....	....	1	4	7	3	1	5	3	19	5	....	4	....	1	10
7	1	....	....	....	8	1	....	....	2	1	4	2	5	4	2	1	14
7	4	1	2	3	17	....	....	1	1	1	3	10	7	12	10	4	43
....	....	1	....	....	1	....	....	....	....	....	....	1	....	....	....	....	1
2	1	....	1	1	5	2	....	1	1	1	5	2	1	....	1	....	4
16	9	16	9	9	59	19	2	3	11	9	44	30	26	19	11	8	94
2	8	2	4	1	17	13	....	....	....	4	17	9	7	8	8	3	35
....	....	1	....	1	2	1	1	2	2	1	7	3	1	2	2	2	10
59	35	14	29	30	167	1	1	....	....	1	3	44	40	54	58	24	220
3	1	1	....	1	6	3	1	4	5	5	18	6	2	6	12	6	32
3	....	3	....	2	8	....	....	....	....	....	....	3	1	2	....	....	6
....	....	....	....	....	....	2	1	1	....	1	5	1	7	....	....	....	8
3	2	2	5	6	18	....	....	....	1	....	1	7	3	4	2	4	20
5	1	1	1	....	8	3	....	2	2	2	9	1	1	3	1	1	7
4	....	....	....	....	4	1	1	....	1	3	6	....	....	....	2	2	4
....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	1	1	3
12	....	3	10	....	25	....	....	....	....	....	....	....	2	....	....	....	2
....	....	....	....	1	1	....	....	....	1	1	2	1	....	....	....	2	3
10	9	4	5	7	35	12	2	3	5	4	26	6	4	7	11	10	38
....	....	....	1	....	1	1	....	....	....	....	1	....	1	....	1	....	2
....	....	....	....	1	1	5	....	1	....	....	6	2	2	6	1	2	13
1	....	....	....	....	1	2	....	1	....	....	3	2	1	3	5	1	12
1	....	....	....	....	1	....	....	....	....	....	....	....	....	3	....	....	3
6	4	5	....	2	17	2	3	2	2	1	10	5	2	6	2	4	19
....	....	....	....	....	....	....	....	....	1	....	1	1	....	....	....	4	5
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
1	....	....	2	3	6	....	....	....	....	....	....	2	1	2	3	2	10
8	5	12	3	7	35	1	1	2	....	2	6	4	3	4	4	3	18
....	....	....	1	2	3	....	1	....	1	....	2	....	2	....	....	....	2
21	1	5	....	35	62	....	....	....	....	....	....	....	1	....	....	2	3
199	98	98	82	139	616	99	27	41	53	59	279	180	159	190	189	124	842
7	4	4	3	5	23	4	1	2	3	4	14	6	6	7	5	4	28
Average No. of Reporters for the five weeks of September, 4·60.						Average No. of Reporters for the five weeks of September, 2·80.						Average No. of Reporters for the five weeks of September, 5·60.					

TABLE. II.—Meteorological Report for Ontario, supplied by Dominion Weather monthly averages of the various meteorological conditions, arranged in accordance with the

MONTHS.	TEMPERATURE.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.
		°	°	°	°	°	°	°	°	°	°
October	Mean	49.7	47.3	48.9	50.0	49.7	50.1	52.8	53.4	53.7	55.4
	Highest	78.3	78.8	73.3	76.6	78.0	76.9	77.0	72.7	75.4	83.7
	Lowest	26.5	25.3	25.3	24.1	26.0	22.6	25.0	29.0	33.0	29.0
November	Mean	31.6	29.6	32.7	33.3	33.8	33.4	35.8	35.9	37.0	38.6
	Highest	60.0	60.2	62.4	68.9	61.0	66.1	70.0	58.8	66.2	68.8
	Lowest	12.3	9.5	4.2	—5.0	7.0	2.4	11.0	11.8	18.0	14.9
December	Mean	18.6	17.0	19.7	22.9	23.8	23.1	25.8	26.2	26.4	26.9
	Highest	37.9	37.6	37.7	38.8	42.0	38.1	40.0	37.9	38.0	43.0
	Lowest	—9.6	13.5	—10.0	—10.2	0.0	—10.3	2.0	0.8	6.0	—2.0
January	Mean	6.9	4.2	12.2	14.1	14.9	14.5	16.9	18.5	17.6	18.3
	Highest	40.7	39.5	38.7	38.6	39.0	42.1	42.0	38.9	41.1	44.3
	Lowest	—23.3	—34.9	—31.6	—18.9	—20.0	—18.9	—10.0	—9.0	—6.5	—11.7
February	Mean	13.6	8.9	13.2	17.6	18.7	17.3	20.6	21.4	18.9	22.0
	Highest	45.6	45.9	47.0	44.4	41.0	50.5	55.0	53.1	51.4	57.5
	Lowest	—19.9	—33.2	—27.4	—13.8	—10.0	—17.2	—9.0	—4.1	—8.0	—2.7
March	Mean	15.9	13.5	14.5	19.4	19.12	19.7	21.5	22.7	21.6	27.1
	Highest	43.3	44.8	41.0	44.8	52.0	47.8	48.0	46.9	44.1	59.6
	Lowest	—11.8	—23.2	—20.2	—13.9	—11.0	—17.5	—12.0	—5.8	—1.0	—10.3
April	Mean	37.2	35.3	34.1	37.2	35.4	39.7	39.5	40.0	39.5	44.6
	Highest	69.3	70.4	67.0	67.1	73.0	78.6	80.0	75.7	80.3	86.0
	Lowest	12.8	2.6	1.0	10.0	—1.0	4.0	9.0	15.8	13.0	19.3
May	Mean	51.3	48.4	46.0	49.1	46.7	49.9	50.7	49.7	51.2	52.9
	Highest	81.3	83.7	77.0	75.0	82 0	76.9	80.0	71.7	77.5	80.5
	Lowest	30.7	26.6	20.8	28.8	21.0	27.9	29.0	32.0	34.0	30.3
June	Mean	66.1	63.1	61.1	62.6	60.3	63.6	65.4	63.5	63.4	64.1
	Highest	84.8	91.3	81.7	81.4	82.0	85.7	84.0	82.8	82.5	88.1
	Lowest	44.2	40.1	40.2	37.8	34.0	34.3	38.0	40.0	36.0	37.4
July	Mean	66.4	64.5	63.0	64.6	62.7	66.1	66.2	67.2	66.5	69.9
	Highest	85.0	87.0	82.7	83.9	85.0	86.3	85.0	85.0	84.4	91.1
	Lowest	47.4	42.8	44.2	44.0	41.0	42.8	45.0	47.0	45.0	49.2
August	Mean	65.0	62.6	61.3	62.8	61.6	63.0	64.1	65.3	67.7	68.0
	Highest	85.6	90.5	85.7	83.9	87.0	85.9	88.0	84.0	86.7	93.5
	Lowest	41.0	38.8	39.2	42.3	37.0	39.3	40.0	46.0	47.0	48.4
September	Mean	55.3	54.3	52.8	53.8	52.70	53.9	55.5	56.8	56.6	60.1
	Highest	79.4	83.3	78.0	78.0	79.0	81.5	81.0	76.8	77.3	88.4
	Lowest	31.4	30.4	29.3	29.5	26.0	28.2	28.0	35.0	35.0	33.8

Service, for the year beginning October, 1882, ending September, 1883, showing the ten Districts into which, for purposes of comparison, the Province is divided.

Daily Range.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.
	°	°	°	°	°	°	°	°	°	°
Mean	19.3	21.2	18.1	20.7	19.4	23.6	23.5	18.2	16.0	24.3
Mean highest	59.2	59.5	58.0	60.9	59.4	63.1	64.6	62.2	62.0	67.2
Mean lowest	39.9	36.6	39.9	40.3	40.0	39.5	41.1	44.0	46.0	42.9
Mean	12.4	18.2	14.7	14.8	13.0	16.9	14.2	11.4	10.1	14.7
Mean highest	30.9	36.8	40.4	40.3	40.3	40.9	43.3	41.9	42.6	45.4
Mean lowest	25.3	23.6	35.7	25.6	27.3	24.1	29.1	30.5	32.5	30.7
Mean	13.4	15.9	15.7	12.5	12.3	15.1	11.9	10.8	8.3	11.9
Mean highest	24.4	23.6	27.0	28.5	29.9	29.7	31.6	31.0	30.6	32.3
Mean lowest	11.0	7.8	11.3	16.0	17.6	14.6	19.7	20.2	22.3	20.4
Mean	21·2	25.2	21.0	18.0	18.7	22.3	17.2	14.1	12.8	17.4
Mean highest	17.3	17.5	22.5	22.3	24.3	25.1	25.5	24.8	24.1	30.5
Mean lowest	—3.9	—6.7	1.5	—4.2	5.6	2.8	8.3	10.7	11.3	13.1
Mean	17.2	25.7	24.0	17.8	18.6	21.1	18.9	15.5	14.9	18.0
Mean highest	21.7	21.2	24.0	25.6	28.0	27.4	30.1	28.2	26.7	33.5
Mean lowest	4.5	4.5	0.0	7.8	9.4	6.3	11.2	12.7	11.8	15.5
Mean	21.5	29.4	26.9	22.6	25.5	25.9	21.7	19.5	16.7	22.6
Mean highest	27.0	26.9	27.0	30.2	31.9	32.2	32.3	33.0	30.0	38.6
Mean lowest	5.5	3.0	0.1	7.6	6.4	6.2	10.6	13.5	13.3	16.0
Mean	18.5	22.2	18.9	19.1	18.0	21.4	20.0	15.7	16.5	22.4
Mean highest	48.1	46.2	43.3	46.8	44.4	49.9	49.5	47.8	48.3	56.0
Mean lowest	29.6	24.1	24.4	27.8	26.4	28.5	29.5	32.1	31.8	33.6
Mean	19.1	24.1	21.4	20.1	22.2	21.4	21.2	15.6	16.8	22.3
Mean highest	60.8	60.7	56.1	59.0	57.8	60.2	61.4	57.0	58.0	64.0
Mean lowest	41.8	36.7	34.7	39.0	35.6	38.9	40.2	41.4	41.2	41.7
Mean	14.6	24.2	19.8	20.2	20.9	20.5	20.5	15.5	17.6	17.7
Mean highest	70.7	76.0	70.8	72.5	70.8	73.7	75.9	70.8	72.2	73.0
Mean lowest	56.0	51.9	51.8	52.3	49.9	53.2	55.4	55.3	54.6	55.3
Mean	20.4	24.3	21.1	21.2	20.8	22.3	20.2	15.8	16.4	21.6
Mean highest	76.5	75.7	72.5	75.2	73.1	74.9	76.3	74.4	74.0	80.7
Mean lowest	56.1	51.4	51.4	54.0	52.3	52.7	56.1	58.6	57.6	59.1
Mean	21.0	25.1	22.8	22.1	23.1	24.4	22.0	19.0	16.0	23.8
Mean highest	75.7	75.5	73.3	73.9	73.1	74.8	75.1	74.9	72.4	79.2
Mean lowest	54.7	50.5	50.5	51.8	50.0	50.4	53.1	55.9	56.4	53.4
Mean	22.0	23.0	20.1	21.2	19.4	22.5	21.0	17.4	16.7	22.9
Mean highest	66.8	63.7	63.1	64.8	62.4	65.3	66.0	65.6	65.4	71.8
Mean lowest	34.8	45.6	43.0	43.7	43.0	42.9	45.0	48.2	48.7	48.8

TABLE II.—Meteorological Report for Ontario, beginning

MONTHS.		I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.
October	Mean humidity .	80.0	76.0	......	75	......	84.5	......	......	81	.....
	Mean cloudiness	0.6	0.6	0.5	0.5	......	0.4	0.4	......	0.6	......
November	Mean humidity .	86.5	81.0	......	76	......	88	......	.....	84	.....
	Mean cloudiness	0.7	0.7	0.6	0.7	......	0.8	0.7	......	0.8	......
December	Mean humidity .	89.0	88.0	......	83	......	91	....	......	87	......
	Mean cloudiness	0.8	0.8	0.8	0.9	......	0.9	0.8	. ..	1.0	. ....
January	Mean humidity .	90.0	93.0	......	84	......	87.5	......	.....	86	......
	Mean cloudiness	0.6	0.5	0.7	0.7	.....	0.8	0.7	.....	0.9	......
February........	Mean humidity .	84.5	81.0	.....	80	......	83	......	......	86	......
	Mean cloudiness	0.7	0.5	0.7	0.7	... ..	0.7	0.6	......	0.8	.....
March	Mean humidity .	81.5	77.0	......	74	.....	81	......	.....	83	......
	Mean cloudiness	0.5	0.5	0.4	0.6	......	0.6	0.4	.....	0.7	......
April	Mean humidity .	71.5	71.0	......	69	......	75	.....	......	82	......
	Mean cloudiness	0.5	0.6	0.4	0.7	......	0.6	0.5	.....	0.6	......
May	Mean humidity .	70.5	71.0	.....	72	......	72.5	.....	......	78	.. ...
	Mean cloudiness	0.6	0.6	0 5	0.7	......	0.6	0.6	......	0.7	......
June	Mean humidity .	79.0	77.0	......	79.5	......	81.5	.....	.....	82	......
	Mean cloudiness	0.6	0.6	0.5	0.6	.....	0.6	0.5	.....	0.6	......
July	Mean humidity .	81.0	88.0	......	76	......	83.5	......	....	80	......
	Mean cloudiness	0.6	0.5	0.5	0.5	......	0.6	0.5	.....	0.6	......
August..........	Mean humidity .	82.0	79·0	......	74.5	......	78.5	......	. ....	78	......
	Mean cloudiness	0.5	0.4	0.3	0.5	......	0.4	0.3	......	0.4	......
September	Mean humidity .	81.5	77.0	......	78.0	......	81.5	......	......	79	......
	Mean cloudiness	0.6	0.6	0.4	0.5	.....	0.5	0.5	......	0.6	......

N.B.—*Humidity* is represented by figures representing parts of 100—this being taken to represent complete saturation. *Cloudiness* is represented by parts of unity—this being taken to represent complete cloudiness.

October, 1882, ending September 30th, 1882—*Continued.*

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.
Am't of Rainfall	1.305	2.070	2.95	1.32	2.33	1.857	0.75	1.35	1.872	2.59
No. of Days....	12.0	13.5	12	8	7	6.5	3	10	11	7
Hrs. of Sunshine	167.3	....	....	202.6	....	185.6	....	....	....	166.5
Am't of Rainfall	1.138	3.115	3.31	2.24	1.40	3.355	2.66	2.98	2.722	1.48
No. of Days....	9.0	10.5	11	14	7	14	9	16	17	9
Hrs. of Sunshine	80.8	....	....	82.6	....	78.2	....	....	....	81.5
Am't of Rainfall	2.723	2.985	3.80	3.39	5.00	4.197	1.88	2.93	3.638	0.60
No. of Days....	20.0	14.0	24	19	18	17	6	22	27	8
Hrs. of Sunshine	35.0	....	....	35.9	....	14.3	....	....	....	35.0
Am't of Rainfall	1.735	1.895	3.44	2.74	5.14	2.535	1.25	2.39	1.127	1.15
No. of Days....	14.5	12.0	22	15.5	18	14.5	5	20	20	9
Hrs. of Sunshine	96.3	....	....	84.5	....	69.8	....	....	....	71.7
Am't of Rainfall	1.952	2.045	3.80	3.09	5.37	6.499	2.0	4.74	4.478	2.41
No. of Days....	15.0	10.0	22	15.5	21	16.5	5	21	17	11
Hrs. of Sunshine	107.2	....	....	119.9	....	105.0	....	....	....	96.8
Am't of Rainfall	2.590	0.975	0.75	2.22	0.98	3.140	1.10	2.48	2.00	1·40
No. of Days....	9.5	6.0	13	12.0	7	10.5	6	18	12	4
Hrs. of Sunshine	181.8	....	....	191.3	....	163.2	....	....	....	150.1
Am't of Rainfall	1.565	1.265	1.79	2.12	1.38	2.076	2.10	1.85	0.772	1.20
No. of Days....	7.5	9.0	9	11	7	9.5	5	13	9	8
Hrs. of Sunshine	244.7	....	....	199.6	....	165.8	....	....	....	192.6
Am't of Rainfall	2.517	5.580	3.49	4.40	2.98	4.338	5.55	5.47	3.549	4.72
No. of Days....	18.0	13.5	13	17.5	10	17	9	19	20	18
Hrs. of Sunshine	210.1	151.9	....	192.3	....	178.7	....	....	....	198.2
Am't of Rainfall	3.152	7.485	3.64	6.46	6.77	6.998	4.75	4.78	4.493	4.30
No. of Days....	14.0	13.5	13	14.5	11	15	9	14	19	11
Hrs. of Sunshine	230.9	....	....	248.4	....	217.1	....	....	....	211.0
Am't of Rainfall	2.468	2.600	3.87	4.83	10.36	3.664	2.98	4.89	6.928	5.32
No. of Days....	14.0	11.0	15	13.5	10	13.5	8	16	17	13
Hrs. of Sunshine	274.1	265.8	....	275.3	....	238.4	....	....	....	279.0
Am't of Rainfall	2.031	3.885	2.62	1.59	3.45	1.625	1.92	1.96	2.30	0.95
No. of Days....	10.0	10.0	11	8.5	6	6	3	6	8	6
Hrs. of Sunshine	247.2	240.0	....	303.4	....	287.2	....	....	....	297.0
Am't of Rainfall	2.476	6.165	4.82	2.32	2.48	2.336	1.80	2.09	3.20	1.97
No. of Days....	11.5	10.5	13	12	7	12.5	7	14	15	6
Hrs. of Sunshine	200.0	143.8	....	192.7	....	179.4	....	....	....	157.4

N.B.—Rainfall is represented in inches.

TABLE II.—Meteorological Report for Ontario, beginning October, 1882, ending September 30th, 1883—*Continued.*

MEAN BAROMETRIC PRESSURE REDUCED TO SEA LEVEL.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.
October	30.030	30.055	30.039	30.066	....	30.081	....	..... .	30.032	....
November	30.115	30.135	30.132	30.159	....	30.168	....	....	30.124	....
December.....	30.015	30.019	30.039	30.054	....	30.088	....	....	30.037	....
January	30.123	30.121	30.095	30.145	.. ..	30.146	....	....	30.117	....
February	30.146	30.148	30.168	30.146	....	30.226	....	. ...	30.202	....
March	29.911	29.925	29.973	29.994	....	30.020	....	....	29.982	....
April	29.964	29.847	29.991	30.001	....	29.997	....	....	29.981	....
May	29.898	29.912	29.930	29.938	....	29.939	....	. .....	29.908	....
June	29.874	29.836	29.873	29.899	....	29.882	....	....	29.878	....
July	29.879	29.866	29.913	29.941	....	29.958	....	....	29.926	....
August	29.954	29.949	30.022	30.023	....	30.028	....	....	30.063	....
September	30.031	30.037	30.059	30.074	....	30.070	....	....	30.076	....

N.B.—Barometric pressure is represented in inches—30.00 inches being equal to normal pressure at sea-level.

TABLE II.—Meteorological Report for Ontario, beginning October, 1882, ending September 30th, 1883—*Continued.*

DISTRICT 4.—TORONTO.

	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.
Mean Temperature of month	51.8	35.9	26.1	17.5	20.1	21.9	38.3	49.3	62.1	65.7	63.7	55.0
Difference from average	+5.6	—0.1	+0.2	—5.4	—2.7	—7.3	—2.6	—2.8	+0.2	—2.0	—2.8	—3.5
Highest Temperature of month	74.3	64.2	40.1	40.5	44.1	46.1	64.6	72.7	78.9	83.4	82.7	75.1
Lowest Temperature of month	28.0	7.2	4.1	—7.8	—10.5	—5.8	11.9	31.1	39.2	46.1	46.3	33.4
Daily range	17.9	12.2	11.0	15.8	16.1	19.4	17.2	18.2	18.7	18.8	18.8	18.0
Average mean max.	60.5	41.6	30.9	25.1	27.4	31.3	46.8	58.3	71.2	74.7	72.9	63.5
Average mean min	42.6	29.4	19.9	9.3	11.3	11.9	29.6	40.2	52.5	55.9	54.1	45.5
Mean Humidity	75	76	83	84	80	74	69	69	77	73	70	76
Difference from average	—4	—5	+2	+1	—1	—4	—3	—2	+3	.0	—5	—2
Mean Cloudiness	0.5	0.7	0.9	0.7	0.6	0.6	0.7	0.7	0.6	0.5	0.5	0.5
Difference from average	—.1	—.1	+.1	.0	—.1	.0	+.1	+.2	+.1	.0	.0	.0
Amount of Rainfall	1.15	2.15	2.79	2.45	2.85	2.36	2.54	4.30	4.96	5.58	1.83	2.38
Difference from average	—1.33	—1.10	—0.24	—0.35	+0.22	—0.55	—0.02	+1.21	+2.11	+2.41	—1.01	—1.10
No. of days	8	17	20	18	18	14	13	19	14	14	8	14
No. of hours Sunshine	211.5	78.1	27.8	86.2	129.7	191.6	184.7	184.0	241.5	275.1	305.1	193.1
No. of hours possible for latitude 45°	340.2	286.9	274.3	285.7	291.4	369.9	406.4	461.1	465.7	470.9	434.5	376.3

N.B.—The report for Toronto is introduced separately in order to show the differences from the average of the various conditions since 1840.

Remarks of the Secretary on the Morbility Statistics and Meteorological Returns contained in Tables I. and II.

In attempting to analyze the statistics presented to us in the preceding pages, representing the weekly returns of diseases to the Board from correspondents located in the various *Districts* into which, for purposes of comparison, the Province has been divided, I am perfectly aware that I am undertaking a task of no ordinary magnitude, and one which, when completed, will probably not appear very satisfactory either to myself or to the large body of physicians who are likely to give them the most careful attention and the most critical examination. But while this is true, it nevertheless appears to me that to those who will carefully enter into the consideration of the facts stated in, and the inferences drawn from these statistics, a large amount of useful information will be obtained, which will not only be of great theoretical interest, but also of much practical importance; and will, moreover, tend to direct the attention of physicians practising in the various localities to a more careful observation of the influences resulting from the physical conditions daily affecting health amongst them.

Before, however, turning to their consideration, it will be necessary for us to enter into some explanations not only concerning the basis upon which the Province has been divided into districts, but also of the various causes apparently influencing the prevalence of various diseases, or classes of diseases.

Regarding the division of the Province into districts for the purposes of comparison, there were, roughly, four conditions of so general a character as to make it appear probable that certain influences, more or less definite, would be attached to them. These conditions are:—

(1) Difference in the surface geology of districts.
(2) Difference in the height above sea-level of districts.
(3) Difference in direction of the prevailing winds of districts.
(4) Difference in the amount and distribution of the forests of districts.

Concerning (1) the difference in the surface geology of districts, it may be stated that while in most of the Province sedimentary rock strata prevail, and while they are for the most part covered with *drift* deposits of various kinds, yet there is a very considerable area in which the gneissoid strata (composed—like granite—of quartz, feldspar and mica) prevail, cropping out at many places, or at most but lightly covered over with vegetable mould and alluvium, and forming the district comprised under the so-called Laurentian Formation of metamorphic rocks, running in a north-westerly direction as a range of low-lying hills from Kingston to Georgian Bay, and including Districts II. and III. of the Health Map. District I. largely lies to the east of this formation. Passing westerly from this formation we have, arranged in regular order, the palæozoic rocks of both Lower and Upper Silurian Periods, followed by those of the Devonian Period. These rocks are in large part limestones; but very considerable formations, such as those of the Utica shales, Hudson River shales, Medina and Clinton sandstones, of different composition, are present in different localities. In large part, however, these formations of stratified rock are, as already stated, overlaid with so-called post-glacial deposits of *drift*, by which it is understood that the erosive action of frost, ice, river floods and lake or ocean currents, upon these strata, or the metamorphic rocks of more northerly districts, has resulted in the formation of immense deposits of rock *detritus*, arranged in regularly or irregularly stratified layers upon the underlying rock surface, which has been left in some cases level and regular, and in others broken and irregular. We will thus see that these superficial deposits vary considerably in their composition according as the rock from which they were formed was of a limey (calcareous), clayey (argillaceous), or a sandy (arenaceous) character. But owing to the conditions, such as the currents and rate of deposition, under which these layers were formed, there does not seem to be in the composition of the *drift* that relation to underlying rocks which at first sight would seem to naturally follow; nor can there be said to be in any one locality any single deposit absolutely unbroken by layers of a different character. Thus the most tenacious clay will here and there be broken by a layer of sandy loam or gravel. But though this be true, yet there are several char acteristic classes which mark the surface soils of very large areas to the extent of enab

ling us to look for definite general effects being produced by them. Logan has arranged these in his Geology of Canada on a broad general basis, and classifies them as follows:—

I. Boulder Formation, or Glacial Drift of eastern Ontario.

II. Western Ontario Deposits, including:

1. Erie Clays.
2. Saugeen fresh-water clays and sands.
3. Artemisia gravels.
4. Algoma Sands.

Without referring to many interesting facts concerning local superficial geology, it may be stated that, as Logan says, glacial *drift*, with its boulders, forms the surface of the country over much of the triangular area included by the St. Lawrence, the Ottawa, and the meridian of Kingston, especially along the south-western portion.

Stratified clays and sands, however, fill up depressions of greater or less extent over this surface, and over these parts erratic blocks (of rock) are rare. Along the Ottawa, ridges of glacial *drift* or of boulders, running north and south, like *moraines* are seen in many places.

In many parts of this district the boulders of *gneiss* and *labradorite* appear on the extended rock surface, the *detritus* in which they were deposited having apparently been washed away.

Regarding the *drift* of western Ontario, it may be said that the stratified clays of the Erie and Saugeen divisions are by far the most extended in area and the most constant in character. Concerning them, Logan remarks, that the *lower* (Erie) clay was partially worn away before the deposition of the *upper*, hence the latter rests unconformably upon it. The upper has often associated with it beds of sand and gravel—a layer of this often marking the division between the two.

The lower or Erie clays are, when moist, of a blue colour, with thin gray bands. They are more or less calcareous and always hold large boulders and pebbles in greater or less abundance.

The upper or Saugeen clays are largely developed along the Saugeen River. They consist of thinly-bedded brown, calcareous layers, generally containing but few boulders. Sometimes these are underlaid by beds of sand, separating it from the Erie clays, and in certain parts it is interspersed with sand and gravel. The vertical thickness of the Erie clays is not more than 200 feet at any one point; but clays apparently of this division occur at various levels from sixty feet below Lake Ontario to at least 100 feet above Lake Huron, thus showing a total difference of 500 feet in level.

Locality of the Erie Clays.—They run, with few exceptions, along the north shore of Lake Erie from Long Point westward to the Detroit River, and appear to underlie the whole country between this point of the lake and the main body of Lake Huron. They are again found at Owen Sound and along the Nottawasaga; and occur again along the shores of Lake Ontario as far as Brockville. They seem to be more calcareous in their north-western part than elsewhere, causing them in some cases to become unfit for making bricks.

Their wide-spread prevalence over the Province is seen in the fact that they are used in the manufacture of bricks at St. Mary's, London, Woodstock, Dundas, Toronto, as well as at Cobourg, Belleville and other places in the east.

It must be remembered, however, that it is not to be understood from this that the Erie clays come to the surface in all these places, since in some cases their presence is only known by their occurrence along the declivities of river-valleys, railway-cuttings, etc.

In many places, especially those of the grounds rising as we recede from the lake shores, these clays are overlaid by those of much less constant composition. Clays, however, predominate through all the townships bordering on Lakes Huron and Erie, from the mouth of the Saugeen to that of the Grand. Thus, for instance, the clays extend from St. Clair village along the lake and river Detroit until Lake Erie is reached. Again, while both Erie and Saugeen clays rise in cliffs at Port Stanley and Port Talbot to 150 feet, the latter regularly laid upon the former, we have the underlying Devonian rocks apparently denuded of Erie clays, and overlaid by no great thickness of a reddish brown clay in the lake townships of Rainham and Walpole (Haldimand), and Woodhouse, Charlotteville and Walsingham (Norfolk). Similar brownish or buff clays extend across

the Grand River to the townships along its eastern bank below Brantford and those from the mouth of the river along the lake as far as Niagara. We thus see that the continuity of these clays in this lake district is well marked.

Much of the country lying between the Niagara escarpment and the south shore of Lake Ontario is underlaid with clay, and, though often appearing at the surface, it is frequently covered with sand.

At Thorold, both clays appear, while at St. Catharines the Erie clays crop up as they also do in Louth Township. From Grimsby, the upper clays thin out, and at Hamilton have disappeared. The district between the Desjardin Canal and the Ancaster escarpment admirably exhibits the Erie clays denuded by the action of rapid streams, with the hollows in many cases filled with sand and gravel and holding fragments of rock and pebbles. These Erie clays are seen here and along the lake shore until Toronto is reached, near which they are extensively worked into bricks. Over the irregular and denuded surface of this stratified clay is here and there spread a coating of yellow clay and sand. Some of these clays have been worked into red brick. East of Toronto, the Erie clays are generally overlaid with sand which continues through York and Scarborough. At Port Hope, banks of clay overlaid with sand rise above the lake. Between Cobourg and Napanee the stratified clays appear in many localities and are of a blueish or yellowish character. Both the Erie and Saugeen divisions seem to be represented amongst them. To show that minor variations in these *drift* deposits are abundant in this section, we have the fact given us, that a railway cutting at Belleville shows from above downward :—(1) four feet of yellow sand ; (2) three feet of brown clay and sand, and (3) eight feet of stratified blue clay. The latter rests on the uneven surface of the boulder formation. Near Kingston a narrow belt of what appears to be the upper (Saugeen) clay appears. In the townships behind Kingston, a similar brown clay often occupies the levels between the rocky ridges. In Ketley Township, a brown clay appears resting upon a blue clay. At Brockville, a blue clay with boulders is overlaid by several feet of brownish clay.

We have given the chief characters of the post glacial strata, or superficial deposits, making up the soil in Districts I. and II., which may be said to be those of the boulder formation ; and of Districts IX., X., VIII., VII., IV., or those the Erie and Saugeen formations.

We have now to speak of the formations which make up the central plateau known as District VI. In a rough way this district, beginning at the summit of the Niagara escarpment at Dundas, trends westward in the course of the Great Western Railway. As already seen the upper reddish clays, with admixtures of sand and gravel, are seen on the east side of the Grand River. These at Copetown show a thickness of eighteen feet and of thirty feet at Harrisburg. About Brantford, Paris, Princeton, and Ingersoll the brown clay is found, often mixed with, or resting upon a gravel. At Woodstock they appear thirty feet thick but resting on a blue clay. These upper beds predominate at London. Thus the excavation for a well showed (1) twenty-two feet of loam and sand ; (2) sixty-six feet of hard pan (clay) ; (3) four or five feet of sandy clay. It will thus be seen that it is only in the eastern part of this southern limit of District VI. that any great regularity of the clay deposits is seen. North from this line these gradually give place to what Logan calls "a belt of loose gravel, remarkable for its great extent," and which stretches in a southward direction across the peninsula of western Canada, from near Owen Sound to Brantford, or for about 100 miles. Its average breadth is twenty-three miles, and has a total area of 2,000 square miles. Its approximate limits are : *On the west*, beginning with Sydenham Township (Grey), on the north, its westerly limit goes to the west side of Bentinck (Grey). Proceeding thence, and curving slightly to the eastward, it intersects the eastern half of the southern boundary of Normanby (Grey). The curve is now reversed and takes in the north-east corner of Minto (Wellington), and the northern half of Arthur (Wellington). Entering Luther (Wellington) it again curves eastward and includes the southern part of the township. Thence it proceeds directly to the north side of Wilmot, thence to the northern part of East Oxford, then turning eastward strikes the Grand River near Brantford.

Again starting from the southwest of Sydenham its *eastern* boundary extends thence

across Holland to about the middle of the west line of Euphrasia (Grey), and then, here having a northward spur, it reaches the Beaver River, in the north of Artemisia. Thence it runs north-eastward and curves round, making a promontory, including a small part of Collingwood Township (Grey), and most of Osprey. It forms a western concave circle in Melancthon (Grey), thence continues into Mono (Dufferin), and runs out in a long spur between Albion (Cardwell) and Adjala toward the Oak Ridge. Leaving the south side of this spur it continues from the south-west line of Caledon, with a gentle curve to the eastward, till it reaches the centre of Puslinch (Wellington); bisects the north line of Beverley (Wentworth), and after forming a spur in this township returns nearly to its north-west angle, and follows its western line for several miles, and thence crosses the south-east corner of South Dumfries and reaches the Grand River just below Brantford.

It has a general parallelism with the Niagara escarpment (Burlington ridge) and occupies the highest land in the Province. Its materials consist principally of the disintegrated rock materials of the Guelph formation (Dolomitic limestone) on which it mostly lies, excepting at its southern portion where the Niagara prevails.

Extensive spurs of gravel (the Oak ridge) run north-easterly from this district.

This ridge leaves the Middle Silurian escarpment in the northern part of Albion, running eastward to Darlington, and curving southward into Clark. Thence it runs almost straight to the great bend of the Trent in Sidney. Its general course shows a southward convexity, Lake Ontario showing the opposite.

These extensive deposits, known as the Artemisia gravels, seem to rest, as far as their relations have been made out, unconformably upon the Erie clays, as at Brantford, and upon a blue clay, as seen at Mount Forest and in some excavations at Guelph.

Included along with District VI. in this area of the Artemisia gravel, is the western portion of District V. There remains still the large area included in District III. and part of District II., whose superficial deposits require a brief description. On the upper part of it, lying between Lake Huron and the Ottawa, thinly bedded clays have been found in the valleys of many rivers. Sand is here and there seen, as along White Fish Lake shore, etc., piled up in *dunes* arranged in a series of terraces rising, in some cases, to over 100 feet. Drab clays have been found along the upper Maganetewan, 1,000 feet above the sea, and on the Upper Muskoka river, and are allied to those amongst the hills between Georgian Bay and Lake Simcoe. Most of these clays are apparently of the same age, and have the same relations, as the Saugeen clays. In the southern part of this district, lying between Georgian Bay and the Ottawa, nearly all the soil covering the rock is yellow sand, known as the Algoma sand. It overlies too the clays which here and there are found in this region, seen especially along the rivers. On the higher levels, as at 800 feet, the sand is succeeded by coarser gravels, passing into coarse shingle and boulders on still higher levels, as about Lake Nipissing.

Besides these generally wide spread *drift* formations, forming the soils of Ontario, there are several so-called ancient beaches and terraces in several parts of the Province, made up of local sand and gravel accumulations. Their height and direction doubtless cause them to enter as prominent factors into the local phenomena of various localities.

Thus there is a very large sandy tract in Simcoe County, lying south-eastward from Nottawasaga, having an area of more than 300 square miles. It extends over the whole of the Township of Sunnidale, the western part of Flos, north-eastern part of Nottawasaga and the north half of Tossoronto and of Essa. It is a yellowish grey sand some seventy or eighty feet deep. It has clay below. A similar ridge runs near Penetanguishene.

Running in a general north-westerly direction there are several extended gravel ridges in Wellington and Bruce.

Such, then, are in outline the chief features presented by the superficial *drift* deposits which overlie the rocks of the Laurentian and Palæozoic ages, whose Formations compose the geology of the Province of Ontario. It will at once be seen that within wide limits there are distinctive differences in the soils of the various parts of the Province. While there are many minor differences in the distribution of clay, sand and gravel, yet the great predominance of some one or other of them over a wide-spread area, is such as to produce very definite influences, not only upon the kind of vegetation and agricultural products, but also upon the ground water, ground air and doubtless the super-ambient

atmosphere. It hence becomes our duty to attempt some partial enquiry into the question of whether the influence of such varieties of soils further extends to the general health of the animal, and especially human, populations of these areas.

But a second basis for the division of the Province into districts, was that of the—

(2) *Difference in the Height above Sea-level of Districts.*—A moment's reference to Diagram C of the Weekly Health Bulletin, must show any one that the differences in height above sea-level of different parts of the Province are in some cases very marked indeed. How it has come about that so comparatively narrow an area of country, without having any great portion of even its highest lands taking on the mountain form, exhibits such great differences of level, it does not come within the province of our work to enquire; but it suffices to state that the changes of level which have resulted in such are intimately associated with the other fact soon to be referred to, viz., that of the great portion of the Province being almost surrounded with enormous bodies of fresh water.

One of the results flowing from difference in height above sea-level is a decrease in the barometric pressure, or in the weight of the atmosphere, in proportion to the increasing height of any place above the level of the sea. Thus there is a fall of about one inch in the height of the column of mercury in the barometer for every 700 feet of height above the sea-level. Hence it will be seen that since the average of such a large area as District VI. is at least 1,000 feet above the sea-level, and since, moreover, some places in it have a height of over 1,500 feet, there must be a very considerable influence as the result of this difference.

(3) *Difference in the Prevailing Winds of Districts.*—A mere glance at the map of Ontario shows us at once that its position is one of peculiar interest and importance from the standpoint of physical science, inasmuch as there is not a single section but has certain phenomena distinctly peculiar to it. Thus we have, looking toward Georgian Bay, an area rising with very considerable rapidity inland till the height, forming a watershed from which its streams flow, is reached. In fact it is a definitely marked out physical area exposed to the direct influence of winds blowing from a large body of ever cold water on the north. District IX., again, rising less rapidly in a similar way toward the central plateau of the Province, is exposed to the influence of westerly breezes which, as will be seen, produce very definite effects upon the range of temperature over the area. District X. is peculiar in that it is directly exposed to the influences of the winds blowing from a shallow, though still cold, lake lying to the north and those from a large and comparatively shallow lake to the south. District VIII. is peculiarly under the influences Lake Erie breezes, while District VII., like District X., has the winds from both north and south sweeping over it. The large area of District IV., bounded by the Niagara escarpment, and the high lands of the oak ridge and other less marked lake beaches, is, with its southern exposure, in a large measure influenced by the winds from Lake Ontario. District I. has the waters of the broad St. Lawrence and Ottawa to influence the winds, while Districts II. and III. have the wooded belt of forest of almost unlimited extent protecting them on the north, and in large degree preventing the sweeping over them of winds largely unbroken in their course, as is now unfortunately the case in the other Districts of the Province.

(4) *Difference in the Distribution of Forest over various Districts.*—Yearly, the distinctive difference of the Districts of Ontario in this regard are becoming less. As will be seen from the Forestry Report of the Agricultural Department, there are, however, as yet, several districts notably forest regions. It will be seen by reference to a diagram in it, prepared by W. Brown, Esq., Professor of Agriculture at the Ontario Agricultural College, that not only is there over fifty per cent. of forest in the large area lying to the north-east of the Province, but also, that over the area comprised in the Counties of Bruce, Grey, and Wellington more than fifty per cent. of forest is still present. From the various reports for the counties above mentioned in Appendix B. of the Agricultural Commission (1880) it would appear that the amount of forest still in existence in these counties is very considerably less than that given above. Thus, Bruce is reported as having twenty-five per cent; Grey, thirty-four per cent., and Wellington only fifteen per cent. of forest or timber lands.

From this report, we further learn that the above is about the average amount of

forest left in the other districts of the Province, although, in all probability, it is somewhat in excess of that in all the older counties. It will thus be seen, that we have distinctive conditions existent in this respect, for the large area included in Districts II. and III. which have remained in a large degree unsettled till very recent years, owing to the fact of their being largely composed of the rock previously mentioned as the Laurentian formation.

From the facts set forth in these considerations which have led to the division of the Province into health districts for the purposes of comparative study, it will at once appear evident that many difficulties are present in calculating the exact amount of influence upon disease of any physical condition since, in almost every instance, we have more than one definite influence at work. Thus, for instance, the Laurentian rock is very largely associated with the large forest area, and the central elevated plateau of the Province exists in conjunction with the Artemisia sands and gravels.

Hence, even with a study much more careful and extended than either our time, data or opportunities admit of, it will be impossible to do more than draw the more general conclusions as to the disease conditions associated with any one influence. Most extended statistics and data gathered for more than one year will be necessary before definite and practical results can be derived from these physiographical studies.

ABSTRACT from the Report of the Agricultural Commission, illustrating the Nature and Varieties of Soil in the Counties included in the ten Health Districts.

DISTRICT No. 1.

COUNTIES.	WHAT IS THE GENERAL CHARACTER OF THE SOIL IN THIS COUNTY?
Leeeds and Grenville.	These counties are well watered by lakes, streams and springs. Clay and clay loam with sandy loam, the former being predominant. A large area too rocky to be cultivated. There is not much water of a stagnant nature, nor marsh land in these counties.
Dundas.	Clay loam prevails to a greater extent here although there is considerable area of clay and sandy loam, resting on hardpan, clay or sand, at a depth of from fifteen inches to four feet. The county is watered by wells, creeks, and the Nation River.
Stormont.	Clay loam, clay and sandy loam, the former being in excess, all resting on clay, gravel and rock at a depth of from one to ten feet. No marsh lands given in report. Water supply from wells and rivers.
Glengarry.	Clay, clay loam and sandy loam, clay loam predominating. There is about three and a-half per cent. of wet and springy land in this county. The county is watered by wells, springs and rivers.
Prescott.	Greater portion clay loam with clayey and alluvial soils and sandy loam. If well drained nearly all suitable for cultivation. There are 1,000 acres peat bog, and about 700 acres of wet and springy lands. County is watered by wells, springs, and rivers.
Russell.	Sandy loam and gravel, clay loam and heavy clay. There are almost 30,000 acres stony and hilly, thereby being almost unfit for cultivation. About ten per cent. is swampy, and one per cent. wet and springy lands. Water can be obtained by digging at depths from five to fifty feet.
Carleton.	Clay loam, sandy loam, sandy and gravelly, and some heavy clay and black loam. A large area so stony as to make it almost unfit for cultivation, the whole township of Nepean being described in that way. Water from wells and rivers. About 14,000 acres of swampy lands.

DISTRICT No. 2.

Haliburton.	About sixty per cent. sandy loam with gravel and hardpan subsoil from one to three feet deep. Very little clay, clay loam or sand. A very considerable area so stony as to be unprofitably cultivated. Almost seven per cent. swampy. The water supply of county is from lakes, creeks, and spring wells.
Hastings.	Sandy loam is predominant of the soil cultivatable with some clay. Clay loam and black sandy loam; subsoil very variable, quicksand, gravel, hardpan or rock. Very large proportion of county under swamps, springy and well lands. Water supply, wells, springs, and creeks.
Lennox and Addington.	Clay loam chiefly, with a large proportion however of heavy clay, sandy, and black loams. About sixty-one per cent. of whole area of counties can be cultivated. There are swamps to the extent of eight per cent. of whole of county. Watered by springs, creeks, and wells.

DISTRICT No. 2.—*Continued.*

Counties.	What is the General Character of the Soil in this County?
Frontenac.	Principally light sandy loam in some townships, while in others there is large proportion of heavy clay and gravel. The county abounds in small lakes, and there are at least 244,000 acres so stony as to be unprofitably tilled. Some swamps, wet and springy lands. Drainage is not carried on to any extent, Excellently watered by wells, springs and lakes.
Renfrew.	About thirty-four per cent. rocky, stony, and gravelly land useless for farm purposes. Of the land tillable sandy loam thirty per cent., sand nineteen per cent. and clay loam ten per cent. Considerable bottom, swampy and springy land on which drainage would be useful. Numerous lakes and rivers; water supply from wells, springs, and creeks.
Lanark.	Sandy loam, heavy clay, and clay loam predominate. Considerable of sand area, but very little gravelly soil. The subsoil consists of clay, gravel, and hardpan. A very large proportion too stony and hilly for tillage. Very little drainage is done. Water supply from wells good.

DISTRICT No. 3.

Muskoka.	Clay, and clay frequently interrupted by sandy loam and sand. Some very rich alluvial soil. The percentage of the land cultivated is very small in proportion to the whole area, an enormous quantity of which is rocky and extremely unprofitable for farming purposes. Lakes and rivers are interspersed over the territory and pure water can be had at almost any place.

DISTRICT No. 4.

Prince Edward.	Clay loam, heavy clay, sandy loam and gravel, black loam and small per cent. of sand. The subsoil is gravelly and clay, with immense limestone rocks under the gravelly soil. There are numerous rocky ridges throughout the county, and about two and a-half per cent. of stony land unsuitable for cultivation. About sixteen and a-half per cent of bottom and swamps; scarcely any drainage done yet. Good supply of water from creeks, lakes, and wells.
Peterborough.	Clay loam first in order, then sandy loam, black loam, gravelly soil and sand. Thirty-three per cent. of whole area too stony for profitable tillage, and about four per cent. hilly. Ten and a-half per cent. of swamp and springy lands. Drainage carried on to a considerable extent but not much tiles yet used. Springs, creeks, and wells supply water.
Northumberland and Durham.	Clay, clay loam and sandy loam. On the whole the soil is good. Very little unprofitable, stony or hilly ground, nearly all can be cultivated. Very small per cent. of swampy bottom or springy lands. Not much drainage adopted, but what there is tiles are used. Water supply principally wells.
Victoria.	Sandy and clay loams are the principal soils. Northern portions of county so rocky as to leave very small hopes of future cultivation. The area of tillable land is almost forty-six per cent. of the whole. There are large tracts of bottom, swampy, and springy lands. Many beautiful lakes and streams abound, and the water supply is obtained from these and wells.
Ontario.	Clay loam about thirty-seven per cent., and sandy loam about twenty-two per cent., with some heavy clay, the depth being all round from eighteen inches to two feet. Subsoil of hardpan, quicksand (eighteen to twenty feet deep), gravel and clay; considerable portions very rocky and hilly, especially in Rama and Mara for rocks, and Scugog and Pickering for hills. Drainage is carried on to a fair extent. Some swampy and springy lands. Water supply from wells, springs, and creeks.

DISTRICT No. 4.—*Continued.*

Counties.	What is the General Character of the Soil in this County?
York.	Clay loam, sandy loam, and heavy clay are the predominating soils, with a small area of sand, gravelly soil and black loam, the average depth of which is twenty inches, having a subsoil of marl, quicksand and gravel. Only about 3,000 acres too stony for cultivation. Considerable swampy and springy lands. About sixty-eight per cent. of whole area cultivatable. Numerous rivers running through county. About twelve per cent. of farms drained. Springs, creeks, wells supply water.
Peel.	Clay loam thirty-three per cent., sandy loam twenty-two per cent., and clay twenty-three per cent., with a small area of sand and gravelly loam. Gravelly and black loam lands chiefly in Caledon township. A considerable average of stony and hilly lands unprofitable, A small quantity of swampy bottom and springy lands; Numerous creeks. There is not much done in the shape of artificial drainage. Water from wells and creeks.
Halton.	Clay loam about fifty-six per cent., sandy loam sixteen per cent., and heavy clay fourteen per cent. Some black loam, gravelly and sandy soils. Nine per cent. too stony for tillage. Area of bottom, swampy and springy lands inconsiderable. Drainage is carried on only to a very limited extent. Abundance of water from wells, springs, and creeks.
Wentworth.	Clay loam thirty-eight and a-half per cent., sandy loam twenty-six per cent., heavy. clay twelve per cent. Small percentage of black loam, but very little gravel or sandy soi.. Very small proportion too stony or hilly for cultivation. About six and a-half per centl of bottom, swampy and springy land. Hardly any drainage done. Water from wells, springs and creeks.

DISTRICT No. 5.

Simcoe.	Sandy loam, clay loam, sand and heavy clay predominate, with black loam and gravelly soils in about eqnal areas. Sub-soils of clay, sand, hardpan, swamp and gravel. Considerable area too stony and hilly for profitable tillage. Bottom, swamp and springy,. in area about nine, six and five per cent. respectively. Fifteen out of the twenty-four municipalities have not yet done any drainage. The water supply is obtained from springs, creeks and wells.
Grey.	About one-half of county is cleared, and of this there is eleven per cent. heavy clay, thirty-eight per cent. of clay loam, twelve per cent. of sandy loam, and the remainder gravelly, black loam and sand. Average depth of soil about sixteen inches. There is a very large area, more especially in northern half of county, too stony for tillage. Large quantities of limestone in Sarawak township. Large percentage swampy, and very little drainage effected, Sydenham, only, using tiles. Springs, creeks and wells supply water.

DISTRICT No. 6.

Dufferin.	Clay loam predominates all over the county, although in some places light, sandy soil is to be met with. Dufferin is one of the best farming counties in Ontario; and, if a proper system of drainage were adopted and carried out, almost the whole area could be cultivated. Swampy bottom and springy lands are of inconsiderable extent. The water supply is chiefly from wells.
Wellington.	Clay loam, about thirty per cent.; sandy loam, twenty per cent.; heavy clay, thirteen per cent.; and black loam, twelve per cent. Depth of soil from six inches to three feet. Sub-soils—clay, sand and gravel. Small percentage onlytoo stony for farming. Considerable area of bottom and swampy lands. Drainage is not attended to as it should be, there being very little effected so far. Good supply of water from springs, creeks and wells.

DISTRICT No. 6.—*Continued.*

Counties.	What is the General Character of the Soil in the County?
Waterloo.	The soils are clay loam, sandy loam, heavy clay, and gravelly, with a small percentage here and there of black loam and sand, the depth of all round being from a few inches to five feet. Sub-soils chiefly sand, clay and gravel. Very little stony or hilly lands incapable of cultivation. Two per cent. swamp, nine per cent. bottom, and one per cent. springy lands. Ten per cent. of farms tile drained. Water—springs, creeks and wells.
Oxford.	About fifty per cent. clay loam, twenty per cent. sandy loam, sixteen per cent. heavy clay, black loam—sandy and gravelly—depth six inches to fifteen inches. Clay, sand and gravel sub-soils. No stony or hilly lands impossible of cultivation. About six per cent. bottom, and six per cent. swamp. A small area wet and springy land. Considerable progress has been made in drainage, and tiles are principally used. Water supply from wells chiefly.
Perth.	Clay loam is largely the predominating soil, with heavy clay and sandy loam next in order. Remainder made up of sand, and gravelly soils. Depth from eight inches to ten feet. Sub-soils—hard clay, sand and limestone. Hilly or stony lands of little or no area. About eight per cent. is bottom, and a small quantity of swampy lands. Fully sixteen per cent. of whole cleared area is drained—one-third of tile. Water from springs, creeks and wells.
Huron.	Clay loam is the chief soil here, its average of the whole area cleared being forty-eight per cent. and sandy loam sixteen per cent.; balance made up of heavy clay, sand, gravelly and black loam. Sub-soil—clay and gravel. County almost free from stony land, with the exception of Tunberry township. Considerable drainage, but very little tiles used. Water supply—springs, creeks and wells.

DISTRICT No. 7.

Welland.	The soils are respectively in area, clay loam, heavy clay on rock, black loam, and sandy loam with small proportions of gravelly and sandy soils, depth from one to seven or eight feet. Subsoils of clay and hard pan and the heavy clay resting on rock. Stony and hilly lands not uncultivable. Wainfleet and Humberstone townships have a large area of bottom lands. There is considerable swampy land but very little springy in the county. Very little drainage is done—no tiles. The county is well watered by the Chippewa and other creeks, the canals, springs, and wells.
Lincoln.	Hard clay, clay loam, sandy loam, and sand are the staple soils of Lincoln, with considerable area of black loam and gravelly; depth six to fifteen inches. Subsoils of reddish clay and hard pan. About 3,000 acres of hilly land are difficult, if not impossible to cultivate. Considerable area of bottom lands, a little swampy, but none wet or springy, all of which could be redeemed and made into good arable lands. In some townships no drainage has been executed, while in others comparatively little. Water supply—springs and wells and a few small creeks.
Haldimand.	The soil here is a mixture of clay loam and clay, but as it nears the lake and Grand River it is changed into sand and gravel. A very large area of the county rests on lime and a formation of sandstone intersected by a number of streams. Nearly the whole county is rolling and thoroughly fitted for excellent cultivation. Very little wet, swampy or springy lands from the fact that the Grand River acts in the capacity of a great natural receptacle for surplus water, thus saving the farmers the labour of making drains, which they appear to have taken advantage of. Water good.

DISTRICT No. 8.

Counties.	What is the General Character of the Soil in this County ?
Norfolk.	Sandy loam first, in order of quantity, then comes clay, clay loam and sand. Some black loam but little gravelly ; depth ten to twenty-four inches. Subsoils, clay, sand, and hardpan. Very little hilly land unfit for tillage and none stony. Some bottom, swampy, wet and springy lands which are, however, strongly susceptible of effectual drainage. Water supply is from springs, creeks, and wells, which is very good.
Elgin.	The soil is chiefly clay, clay loam, and sandy loam from ten to forty-eight inches in depth, having subsoils of clay and sand. Very small percentage of swampy, wet or springy land, and very little stony land which cannot be cultivated, but of hilly land there is a small per cent. unsusceptible to cultivation. There is considerable attention paid to drainage. Water from springs, creeks and wells.

DISTRICT No. 9.

Bruce.	Soils here are very variable, they consist of clay, clay loam, sand, sandy loam, black loam, and gravel, the subsoils being hard, fine sand, clay and limestone. Large area of the townships of Bruce, Amabel and Arron very rocky, and a considerable portion of whole area is reported to be bottom, swampy and springy lands. Not much drainage yet effected, but a scheme to this end, on a large scale, is contemplated. Watered well by creeks, springs and wells.

DISTRICT No. 10.

Middlesex.	Heavy clay, clay loam, and sandy loam are the chief soils here, with a depth from twelve to twenty-four inches, having for subsoils sand and clay. Close on 6,000 acres are too hilly for profitable cultivation. Considerable percentage of bottom and swampy lands, but small proportion of wet and springy. Fair progress made in tile drainage, the known advantages of which are causing those who have been indolent in the matter to embrace the opportunities that time and money afford to go into it largely. Water from rivers and wells.
Lambton.	Clay loam, heavy clay, and sandy loam are the prevailing soils, the average depth being eighteen inches, and the subsoils generally clay. The county is entirely clear of rocky or stony lands. Only about 1,000 acres—in Bosanquet—too hilly. Considerable bottom lands, but very little swampy, wet or springy lands. The Tile Drainage Act has been, and is being, taken advantage of by most farmers, who see in this " tile draining " future qualities of soil to raise crops recouping them an hundred fold for their trouble. Water—river, creeks, and wells.
Kent.	Clay loam, sandy loam, and heavy clay predominate with some sand, gravel and black loam, which latter is very rich. Depth from two to eight feet. No rocky, stony, or hilly lands unfit for cultivation. Bottom is of pretty large area, with considerable swampy and wet lands, nearly all of which can be reclaimed through drainage, which has already, where tried, done immense good to the soil and its produce. Farmers are becoming alive to the advantages conferred by the Drainage Act. Well watered, only Tillbury, whose creeks run dry in summer.
Essex.	Principal soils are black loam, clay and sandy loam, with some clay, sand, and gravel. Depth from four to eighteen inches. Good deal of marshy lands in three or four townships, but could be made very profitable by draining. No stony or hilly lands. The Drainage Act, for reclamation of wet lands, has done immense good in turning wastes into beautiful cultivable soils, and farmers generally seem to be fully alive to its great importance. Water supply, springs, rivers, creeks, and wells.

Article IV.

LIST OF CORRESPONDENTS OF THE BOARD WHO HAVE BEEN WEEKLY REPORTERS OF DISEASE.

Reporters in District No. 1.

Dr. J. S. McCallum, Smith's Falls, Lanark.
" G. H. Groves, Carp, "
" H. P. Wright, Ottawa, Carleton.
" R. W. Powell, " "
" A. Robillard, " "
" Steven Wright, " "
" H. B. Small, " "
" A. D. Wagner, Dickinson's Landing, Stormont, Dundas and Glengarry.

In District No. 2.

Dr. J. D. Kellock, Perth, Lanark.
" W. McFarlane, Almonte, "
" J. G. Baird, Pakenham, "
" J. S. Sprague, Stirling, Hastings.
" W. A. Dafoe, Madoc, "
" H. M. Jones, Marmora, "
" J. Mann, Renfrew, Renfrew.
" B. W. Walton, Pembroke, "
" Jas. G. Cranston, Arnprior, "
" Jas. Knight, Tamworth, Lennox and Addington.

In District No. 3.

Dr. S. Bridgland, Bracebridge, Muskoka and Parry Sound.
" F. L. Howland, Huntsville, " "
" Thos. S. Walton, Parry Sound, " "

In District No. 4.

Dr. J. A. Todd, Georgetown, Halton.
" W. S. Black, Uxbridge, Ontario.
" H. B. Nicol, Cookstown, Simcoe.
" W. H. Taylor, Bradford, "
" W. Caldwell, Lakefield, Peterborough.
" R. Sproule, Peterborough, "
" S. P. Ford, Norwood, "
" J. B. Morden, Picton, Prince Edward.
" Thos. R. Dupius, Kingston, Frontenac.
" C. K. Clarke, " "
" John Brandon, Ancaster, Wentworth.
" A. H. Walker, Dundas, "
" John A. Mullin, Hamilton, "
" A. Wolverton, " "
" A. Robinson, " "
" A. E. Malloch, " "
" Thos. W. Poole, Lindsay, Victoria.
" C. Robinson, Claude, Peel.
" Alex. Patullo, Brampton, "

Dr. J. H. Burns, Toronto, York.
" Wm. Oldright, " "
" J. J. Cassidy, " "
" John Fraser, " "
" A. McPhedran, " "
" W. W. Ogden, " "

IN DISTRICT NO. 5.

Dr. E. D. Morton, Barrie, Simcoe.
" Thos. Wylie, Stayner, "
" Geo, Brown, Elmvale, "
" P. E. Kidd, Midland, "
" John Hanly, Waubashene, "
" C. E. Barnhart, Owen Sound, Grey.

IN DISTRICT NO. 6.

Dr. D. L. Philip. Brantford, Brant.
" W. Burt, Paris "
" W. Graham, Brussels, Huron.
" W. H. Lowry, Acton, Halton.
" G. P. Sylvester, Galt, Waterloo.
" H. G. Lackner, Berlin, "
" H. Howitt, Guelph, Wellington.
" Angus McKinnon, Guelph, Wellington.
" L. Brock, " "
" A. Groves, Fergus, "
" W. H. Johnson, " "
" H. P. Yeomans, Mount Forest, "
" John Nichol, Listowel, Perth.
" W. Lehman, Mitchell, "
" H. M. Mackay, Woodstock, Oxford.
" J. R. Walker, Ingersoll, "
" E. G. Edwards, London, Middlesex.
" N. McKechnie, Thorndale, "
" J. Gillies, Teeswater, Bruce.

IN DISTRICT NO. 7.

Dr. G. A. McCallum, Dunnville, Haldimand.
" R. J. McKinnon, Caledonia, "
" W. J. Burns, " "
" Chas. Battersby, Port Dover, Norfolk.
" R. A. Alexander, Grimsby, Lincoln.
" Frank King, Port Colborne, Welland.

IN DISTRICT NO. 8.

Dr. L. C. Sinclair, Tilsonburg, Oxford.
" R. H. Dee, Tuscarora, Brant.
" D. Marquis, Mohawk, "
" H. Meek, Port Stanley, Elgin.
" R. P. Mills, Dutton, "
" W. J. McInnes, Victoria, Norfolk.
" W. B. Franklin, Port Rowan, "

IN DISTRICT No. 9.

Dr. A. Worthington, Clinton, Huron.
" W. Sloan, Blyth, "
" Thos. F. McLean, Goderich, "
" R. Douglas, Port Elgin, Bruce.
" P. McLaren, Paisley, "

IN DISTRICT No. 10.

Dr. J. Coventry, Windsor, Essex.
" R. Carney, " "
" L. E. Shepherd, Essex Centre, Essex.
" W. B. Lindsay, Strathroy, Middlesex.
" J. L. Bray, Chatham, Kent.
" G. A. Tye, " "
" J. H. Duncan, Thamesville, Kent.
" C. Lake, Ridgetown, "
" J. W. Bowman, Moore, Lambton.
" W. H. Franks, Watford, "
" F. H. S. Ames, Brigden, "
" A. S. Fraser, Sarnia, "

SPECIAL STUDY OF TABLES I. AND II.

BY THE SECRETARY.

Having stated, in the preceding pages, the grounds for dividing the Province into Health Districts, it will now be proper to refer to those conditions which, regardless of district, have always been considered most important in their influence on health in all parts of the world. This being the case we shall rightly expect to find that these influences are general in their effects in all parts of the Province; and that very strongly marked modifications of them, in any particular district, are likely to be due to some of those physical conditions set forth in the preceding pages of this statistical study.

Dr. Ballard in his statistical study of the records of sickness, kept in Islington during twelve years, makes the statement now grown old that "The meteorological conditions which appear to exercise the most decided influence upon the quantity of general sickness are atmospheric temperature and humidity and rainfall." While we accept in full the truth of this statement, it is not without use to amplify the statement by reference to some of the varying conditions in these several factors. We would, therefore, state that in the first place it is in the relationship of these factors that we are to look for influences prejudicial, or otherwise, to health. For instance, the mere degree of high or low temperature *per se* cannot be taken as a gauge of the prejudicial effects upon health of either extreme heat or cold, since both have been and are borne very well by the human constitution, other conditions being favourable. Again, it may be equally asserted that the amount of rain falling in a given month or year cannot be measured in its influence on health by the total number of inches of precipitated moisture, nor can the absolute humidity be taken as the index of the healthfulness of any climate. But while we feel perfectly safe in making these assertions, and while we feel that the following out some one of these influences too closely may have unfavourably affected the conclusions of some statisticians, yet it does not at once appear a matter hardly capable of attainment to so study any one of these, along with the other influences existing at any one time, so as to fix what might be called general formulæ, which can become of popular use, and therefore of public advantage. Nevertheless the very generally recognized truth contained in Dr. Ballard's statement shows that the influence of certain climatic factors are now almost universally

admitted and to some extent known and appreciated. But if it be conceded that it is rather in the relations of these factors to one another than to any fixed and absolute effect of any one of them that we are to look for definite ideas as to their influence, it must at once appear most desirable that earnest efforts be made to determine, to the greatest extent possible, the groups of relationships which appear either most promotive of, or prejudicial to, the health of the individual and, therefore, of the whole people. This is the primary step; but what is of still more importance is the determination, if possible, of the causes which bring about these relationships, so that the study of how those which experience may have proved to be most favourable to the public health, may be inculcated and practised, both by the individual, the community, and the nation at large.

With the intent, therefore, of examining some of these relationships in connection with the number of cases of various diseases reported to the Board as given in the foregoing tables, we have prepared various other tables and diagrams illustrating the prevalence of disease according to months, giving therewith the associated meteorological conditions; also of various diseases both by months and districts together; and of various classes of diseases along with the meteorological conditions, existing throughout both the months of the year and the various districts. It will at once appear that the attempt to make a statistical study of upwards of 150,000 cases of disease recorded during the year is one, the magnitude of which can only be appreciated by those who have in any degree been accustomed to the examination of statistical returns. Before entering upon this detailed study a word or two of explanation regarding the system adopted is necessary. By a reference to Table I it will be seen that not only does the total number of reporters vary from month to month but also from week to week. Moreover, it will be seen that this difficulty is greatly increased from the number of reporters from each district not being the same, either as compared with one another, or from month to month in the same district. It will therefore be at once apparent that in order to institute comparisons which would be of any value, some *unit* or denomination had to be adopted, to which all the numbers must be reduced. As was natural, the unit adopted in Table IV was the total number of reporters in the first month, or the month of October. This number was 224, or a weekly average of 56. To show how the reduction was made an example may be given. The total number of diseases reported for October was 6415; the total number of reporters was 224, hence it appears that the number of diseases reported per correspondent was 28.6. But the number of reporters for November was 272. It hence became necessary, before comparing the cases of any class of diseases in the two months, to bring those of November to the denomination of October, viz., 224. Thus of Intermittent Fever there were reported 459 cases in October, and 423 in November. But as there were 272 correspondents who reported those of November, the reduction to the unit of 224 was necessary. Hence the number of cases comparatively for November was only 350. This then is the method carried out through the Tables III. and IV.

As will be seen in subsequent tables, wherein a comparison is made not only between the number of cases of certain diseases in each month, but also in each district, it became necessary for purposes of comparison to adopt another unit, viz. one for district comparison. It was moreover desirable that this unit should be large in order that any errors from excess or defect in the report of any practitioner would be minimized. For instance, it might readily, and often does happen, that some disease, say Measles, is reported epidemically present by some practitioner. Now if there were few reporters from the district from which such a report came, it must be evident that Measles might appear unduly prominent. But if the number of reporters from such district were large, then the error of excess would be lessened or minimized, because each additional report introduces another set of possible conditions, in consequence of which the average of the total conditions for said district is more nearly obtained. Errors of excess or defect arising from this cause will be referred to in their proper place. This desideratum was attained by taking as the unit the number of reporters for October from the large District IV. This number was 65, or a weekly average of 16.25. To illustrate the method of reduction to this denomination, Intermittent fever may again be taken as an example. The total number of cases of this disease reported from District IV. in October was 138. From District. VI., with 57 reporters, the total number of cases was 51; hence it will at

once appear evident that if 57 reporters returned 51 cases, 65 would return 58.1 cases. The method, then, of obtaining any information from Table I. is evident and easy of application; and has been carried through all the special Tables of the statistics excepting Tables, III. and IV.

Some remarks are now necessary concerning the classification adopted for comparative purposes as seen in Tables I. and IV. In the preparation of the blank forms for reporters, it was a matter for serious consideration, to decide which were the most important diseases to ask for information upon. After serious deliberation the diseases in the blanks of the Michigan State Board were for the most part adopted, with several important additions. It has been found, however, that this list could with profit have been added to, since several diseases of great importance have been omitted. To take but one example, it will be noticed that Anæmia stands very high in all these reports. One reason for this is doubtless found in the fact that Dyspepsia has no place in the list, and Senectus or old age, constituting a considerable number of cases, is absent. Now doubtless there are cases of Dyspepsia which ought not fairly to be placed under Anæmia, although probably Senectus is not much out of place here.

To obviate in some measure this difficulty, the blank page of the forms has been prepared for entering extra diseases. While we have, through experience, learned that this list is not in all respects perhaps the best, yet it is felt that its imperfections are but slight, when compared with the disadvantages flowing from any break in the continuity of the system adopted in the outset. Regarding the classification in Table IV., while it may be said that Table I. in some measure necessitated its adoption, it will be found that it has been prepared with the distinctive purpose of comparison. But, nevertheless, by reference it will be seen that it is made very largely, within the lines of the classification adopted by the Registrar-General of England and in most other countries.

Regarding Class I., while it may be said that in a clinical sense it embraces widely diverse diseases, yet in an etiological sense, it coincides fairly well with the present position of biological knowledge with reference to the several diseases included under it. Class II. can have no objection made to it which could not be made to classifications of every kind. Class III. will doubtless be objected to by some; but it has been made to exclude Bronchitis and Pneumonia both because of their supposed independence of zymotic influences, and because all the included diseases are placed in the authorized classification under *zymotici.*

Class IV., intended to include especially those zymotic diseases which are *par excellence,* eruptive diseases, has had included in it Mumps, as much from the absence of any better place, as because of its contagious nature and its general connection with the eruptive diseases, being essentially a communicable disease.

Class V. has the merit of retaining a distinctive place for tubercular diseases, as at the present day their zymotic character is still *sub judice,* and their communicability can, in no well defined sense, be said to have been established—certainly not in the sense of Class IV.

Class VI. is, for comparative purposes, a distinct class; for while the first might in some of its stages be classed as a distinctly eruptive, and certainly a disease of zymotic origin, yet there is abundant reason for adhering to the old classification.

While the classes above given are all zymotic in character, yet they are all of so distinctive a character that they may well serve a valuable purpose, not only by showing what a large proportion of human ills are due to the influence of other forms of life in their process of development, but also by illustrating the many and varied ways by which disease may assail mankind, and how many are the barricades which must be erected for repelling the assaults of these insidious foes.

TABLE III.—Showing the average number of cases of all diseases per reporter, for each month from October, 1882, to September, 1883.

Order of Prev'lence	Month.	Number of Diseases.	Number of Reporters	Average.	Quarterly Average.
9	October	6415	224	28·6	
12	November	7477	272	27·4	28·0
11	December	10415	371	28.0	
7	January	9470	306	30·9	
4	February	9868	298	33·1	33·8
1	March	13359	356	37·5	
2	April	10079	276	36·5	
3	May	10030	287	34·9	33·1
10	June	8656	307	28·1	
8	July	7625	249	30·6	
6	August	7255	234	31·0	31·1
5	September	8182	257	31·8	

From an examination of the preceding Table III. it becomes at once apparent that, as is known to be the case with mortality statistics, the different quarters and months of the year show variations in the amount of prevalence of disease. To some, the fact that the autumn quarter has been during the year distinctly the most healthy, will be one which, from a study of the mortality returns for Ontario, they would be inclined to expect, since it is found that the deaths, both in 1879 and 1880, were less in this than in any other quarter. By reference to a detailed study of the mortality statistics of Michigan as presented to us in the Report of the Secretary of the State Board of Health, it appears that the average number of diseases reported to that Board for five years is about the same in the first and fourth quarters of the year. This, it will at once be seen, is not at all in keeping with the returns in Ontario, since the first quarter of the year has here the highest average number of any quarter in the year. This important fact, it may be incidentally mentioned, is in exact accord with the mortality returns for Ontario during 1879 and 1880. It at once appears that this discrepancy between two contiguous countries, as Michigan and Ontario, raises the important question of whether such difference actually does exist. The question is one which at present is impossible of solution, from the fact that the method of studying and classifying the reports in Michigan varies so materially from that adopted by this Board, that no close comparison can be made between them. Thus, instead of giving the absolute number of cases of disease reported, Dr. Baker, the Secretary of that Board, has made his comparison by taking the per centage number of reports which stated the presence of the twenty-six reported diseases. While doubtless this method has served a useful purpose in Michigan for indicating to the public the general distribution of any disease or class of diseases, it will be evident, that for statistical purposes, it lacks those elements which make comparison with it of great value.

We have, however, in the records of twelve years' recorded sickness in Islington, London, England, data which are of very great value indeed; since, as they may be fairly taken to represent disease as it exists in London, we can compare with them the records of disease in Ontario, and make the effort to account for or reconcile the differences which may exist between them. Regarding the prevalence of disease, reference to these Tables

shows that, contrary to the returns to this Board, the autumn quarter in England is more sickly than the winter quarter, and almost equal to the summer quarter, which there is the sickliest of the year. Since in Ontario the winter quarter is the most unhealthy, and the spring quarter the next, while in England, the winter quarter is surpassed in unhealthiness both by the summer and autumn quarters, it would appear that, if the returns for this year indicate a general rule, as from the parallelism between them and the Registrar-General's returns they would seem to do, it must be apparent that climatic conditions exist which are very different in the two countries. The fact that in Ontario the spring quarter is almost as sickly as the highest, viz., the winter quarter, while in England it is notably the healthiest season of the year, would likewise point to very different existing conditions in different countries.

Referring to the monthly differences we find that March stands first in order regarding the number of diseases. This is in keeping with the average mortality in Ontario for the five years ending 1880, which appears highest in March. April appears second in prominence, which is likewise in keeping with the above mentioned mortality returns. May appears next, which is at variance with the mortality returns, and greatly at variance with Dr. Ballard's tables, which show May during twelve years to be the healthiest month. February appears next in point of prevalence, which is its position in the mortality returns. But instead of singling these out in their order of prevalence here, it may be more instructive to place them in a table for purposes of comparison.

ORDER OF PREVALENCE OF MONTHLY DISEASES COMPARED WITH THE MORTALITY RETURNS AND ISLINGTON RECORDS OF DISEASE.

Order	Ontario.		Islington.
	Disease Statistics.	Mortality Returns.	Disease Statistics.
1	March.	March.	August.
2	April.	April.	November.
3	May.	August.	July.
4	February.	February.	December.
5	September.	September.	October.
6	August.	May.	January.
7	January.	January.	September.
8	July.	July.	February.
9	October.	October.	March.
10	June.	December.	April.
11	December.	November.	June.
12	November.	June.	May.

The almost complete parallelism between the months of diseases during the past year, and the months of deaths during five years is truly a remarkable fact, and one which, in the most accidental manner, would seem to prove that the arguments for the correctness of these statistics as a general index of disease found in Chapter I. are valid. If this be true it further shows that the past year is a valuable one for purposes of comparative study, since it is in an unusual degree an average or normal year in the matter of disease. Assuming then the correctness of these inferences, we have the most undoubted proof that the conditions which govern the prevalence of disease vary greatly, or at any rate the periods vary at which similar influences are exerted, in England and in Ontario.

TABLE IV.—Illustrating the Prevalence of the six classes of Zymotic Diseases throughout the months of the year, from October, 1882, to September, 1883.

——	October.	November	December	January.	February	March.	April.	May.	June.	July.	August.	Sept'mber
Class I.—Fevers.												
1. Intermittent	459	350.0	269.9	262.1	312.7	455.5	549.5	637.6	564.7	681.0	681.6	677.2
2. Typho-Malarial	91	102.1	51.9	21.9	35.3	30.2	32.4	45.3	60.5	50.4	70.8	82.8
3. Enteric	233	168.9	97.8	79.3	75.1	47.2	28.4	36.7	35.7	58.4	124.5	248.4
4. Cerebro-Spinal	8	2.5	6.0	15.3	9.8	9.4	34.9	53.1	35.0	13.5	8.6	6.1
5. Pyæmia	39	35.4	44.1	46.9	27.8	32.7	28.4	30.4	39.3	33.7	24.0	30.5
6. Erysipelas	199	109.5	105.0	117.1	118.0	129.6	160.7	174.0	120.4	88.1	63.2	64.5
7. Puerperal	12	10.7	16.3	28.5	39.8	22.0	21.9	93.9	27.7	25.2	57.4	13.9
	1041	779.1	591.0	571.1	618.5	726.6	856.2	1071.0	883.3	950.3	1030.1	1123.4
Class II.—Diarrhœas.												
1. Cholera Infantum	129	23.5	12.1	11.6	15.8	11.9	12.2	22.6	50.3	186.2	337.0	306.8
2. " Morbus	110	29.6	18.1	16.1	8.2	11.9	19.5	29.7	38.6	158.3	222.1	170.8
3. Diarrhœa	473	359.9	218.0	235.0	300.7	329.7	396.0	350.4	342.9	763.7	1204.2	855.9
4. Dysentery	125	44.5	28.4	30.0	24.0	42.1	35.7	26.5	30.6	97.1	221.3	236.2
	837	457.5	276.6	292.7	348.7	395.6	463.4	429.2	462.4	1205.3	1984.6	1569.7
Class III.—Respiratory Affections.												
1. Influenza	417	444.0	534.9	614.2	631.4	1171.5	793.7	473.0	161.2	146.6	90.9	234.4
2. Tonsillitis	215	175.4	306.7	330.1	323.2	315.8	277.5	271.6	153.3	143.0	135.0	198.7
3. Croup—Membranous	26	33.7	39.8	43.9	38.3	27.0	34.1	27.3	14.6	23.4	10.5	23.5
4. Diphtheria	179	169.6	193.8	185.2	199.2	141.0	126.6	146.0	110.1	128.6	64.1	82.8
5. Whooping Cough	104	126.8	131.0	129.5	154.1	108.8	91.7	160.8	99.2	219.5	157.9	124.6
	941	949.5	1206.2	1302.9	1346.2	1764.1	1323.6	1078.7	538.4	661.1	458.4	664.0
Class IV.—Eruptive Diseases.												
1. Scarlatina	93	131.7	120.1	145.7	167.8	91.2	77.9	105.4	71.5	54.8	44.0	74.1
2. Measles—Morbilli	75	91.4	88.7	172.7	233.8	586.4	540.5	457.4	371.3	136.7	36.3	56.6
3. Smallpox—Variola	1	0.8	0.0	19.7	0.8	3.1	4.8	0.0	0.0	0.0	0.0	0.0
4. Mumps—Parotitis	59	87.3	94.2	143.5	198.4	205.7	275.1	308.3	192.6	56.6	44.0	21.7
	228	311.2	303.0	481.6	600.8	886.4	898.3	871.1	635.4	248.1	124.3	152.4
Class V.—Tubercular Diseases.												
1. Consumption—Pul'y	307	299.3	289.2	362.3	293.9	322.1	344.1	330.1	308.6	306.7	381.9	291.1
2. Other Tubercular Diseases	39	33.7	33.8	35.1	39.1	23.9	24.3	33.5	27.7	43.2	43.0	51.4
	346	333.0	323.0	397.4	333.0	346.0	368.4	363.6	336.3	349.9	424.9	342.5
Class VI.—Venereal Diseases.												
1. Syphilis	119	123.5	109.3	133.9	118.0	112.6	99.8	110.0	100.7	109.7	56.4	90.6
2. Gonorrhœa	142	154.0	125.6	122.2	99.2	74.2	92.5	109.2	86.1	112.4	107.5	142.9
	261	277.5	234.9	256.1	217.2	186.8	192.3	219.2	186.8	222.1	163.9	233.5

The reasons for arranging the twenty-four diseases of this Table, under six classes have been already explained, and further explanation is thus rendered unnecessary. The classes are sufficiently distinctive to render comparisons between them a study of much interest, although it cannot be said that any one of them is free from objection in this regard. For instance, it cannot be said that the conditions, such as temperature, moisture, etc., which govern in large measure the prevalence of Intermittent Fever are such as make Typhoid or Enteric likely to prevail equally with it. As to those which govern the prevalence of Erysipelas, Puerperal fever, Cerebro-spinal fever and Pyaemia there is much room for study and conjecture, but that several of them exhibit close relations seems to have long been asserted.

Of Class II. it may be said that the diseases contained in it form a more homogeneous class as regards causation and prevalence than any of the others, and have long been considered to be governed largely by one special condition, viz., that of heat.

Of Class III. it may be stated that while, in all probability, they have many elements in common as regards the conditions favourable for their propagation, their causation is in each instance as yet largely a matter *sub judice*.

Class IV. is one which has been so often remarked upon, that, the relations of the individual diseases in it to each other have been more or less thoroughly elucidated.

Class V. consisting of diseases of a most fatal and too prevalent character is one which in the matter of causation has during the past two years taken the precedence of all others in the interest which experiments regarding it have thrown around it.

Class VI. contains two diseases, the conditions for the propagation of which have long been very generally understood; while, of late years, the then supposed cause has been studied with much diligence and apparent success. They are such as from their nature are governed in prevalence by conditions so wholly separated from meteorological changes, that in this study they perhaps lose some of that interest which might otherwise attach to them.

Selecting from these classes a few points of interest, it is important to notice that in the class of Fevers, October starts out with 1,041 cases, comparatively high and exceeded only during the months of May and September, with 1,071 and 1,123.4 respectively. The three diseases which make up the principal portion of those for October are Intermittent 409, Enteric 233, and Erysipelas 199. Assuming the conditions in September to be similar to those in October, it will be of more interest to compare the months of October and May. It appears that contrary to general opinion, Intermittent which, after the winter recession from a high prevalence in October, began to increase in March, reaches in May almost the highest point attained during the year. Enteric, on the other hand, almost at its highest point in October appears, if we except April and June, at its lowest prevalence in May. Erysipelas, finally, is seen to approach nearly the same position in both months.

Now what are the distinctive meteorological conditions existing during these two months? By reference to Diagram I., it there appears that a remarkable similarity exists in the temperature, both as regards height and monthly range. By reference to the humidity and rainfall, it will, however, be seen that a marked difference exists between both in the two months. While the humidity in October is high, that in May is unusually low. But the rainfall shows, on the contrary, the very opposite condition, inasmuch as October has a very small, and May a large amount of rain. One other point for comparison is left in the barometric pressure. In keeping with the large amount of rainfall, the height of the barometer in May is more than the tenth of an inch lower than in October, the average during October being above the normal height of the barometer. From these collated facts it appears that Erysipelas does not seem to have any constant relations to weather conditions, being much the same in the two months. The fact of the difference in prevalence of Enteric Fever in the two months, is one, which has frequently been noticed, and which amply illustrates the now generally recognised statements of Pettenköfer and Bühl, that its prevalence is largely regulated by the height of the ground water. For instance, it will be remembered that the later summer months of 1882 were wet, and were succeeded by a dry September, and, as we see, an unusually dry October. This lowered very greatly the ground water, and aided the decomposition of the organic matter

already carried into the soil, by the increase in the depth and amount of ground-air. The lowered water made wells ready receptacles for the drainage from the surrounding soil, and thus the conditions are fulfilled, which statistics and experience have proved regarding well-water being one of the commonest means for the propagation of the disease.

The excess in prevalence of Malaria in May over that in October, it will be seen, is a fact so contrary to the generally received opinions regarding this disease that it is deserving of a moment's consideration. Before discussing the question of why it is more prevalent in May, we must be sure that it is so. Now the figures that are given in Table IV. have been, as we have already seen, reduced to the same unit; but there is a possible source of error from taking this as our basis of calculation, due to the fact that in Districts VII, VIII, and X, the Malaria districts, *par excellence*, the number of reporters in October might have been very much less than in May. But this is really not the case, for if we reduce the number of reporters for each of these districts individually to the same unit, we get:

SHOWING PREVALENCE OF MALARIA.

Districts.	Number of Reporters reduced to same unit.				Total cases in each District.	Average of Cases.
	VII.	VIII.	X.	Total.		
October	17	6	23	46	316	6·8
May	15	22	22	59	565	9·7

It thus appears evident from this table that May has notably more Malaria than October; and if we subtracted from our calculation District VIII, always liable to error from the fact of its containing the reports from Dr. Dee, the physician to the Indians, which apparently are subject to greater variations than reports of the practitioner in more settled communities, the fact would stand out even more prominently. Now the facts, apparently established here beyond dispute, are perhaps too limited to draw any general deductions from; but they, at any rate, seem to coincide with the following extracts from Miquel in his generalizations from three-years' daily observations on the microscopic organisms in the air. He says:—" In general, the number of bacteria, little increased in number, increases in spring, remains high in summer, and falls rapidly in the autumn. This is at least what appears to result from the general mean deduced from monthly means obtained during three years at the Observatory of Montsouris (Paris), where the winter decrease of the number of microbes is always marked with much distinctness." . . . .

" Let us now analyse more exactly the influence of dryness on the richness of the air in microphytes. In summer, in the period of strong and continued heat, the atmosphere gets rid toward the second or third week of summer of microbes whose existence it was easy to prove during the first pleasant days; everything considered, the number of germs diminishes and that by the fact of a desiccation which removes from them with much of their vitality the faculty of propagating in *media* wherein they are placed."

It thus appears from these quotations that in the first place our colder climate will cause the reduction of micro-organisms sooner in the autumn than at Paris; and in the second place the application of the facts regarding the dryness of soil to the organisms in the air in October is natural and logical, and has force added to it from the fact of the previous September having been similarly dry and pleasant. May, on the other hand, was preceded by a warm and unusually dry April, which would, as we have seen, aid the following out of Miquel's first rule.

In examining Class II of Table IV, or that including Diarrhœa as it appears in its various forms, there would seem at first sight to be a general coincidence of its prevalence with

the increase in the mean height of monthly temperatures. While in a general way this is true, yet a close scrutiny reveals several interesting facts worthy of note. Declining in prevalence with temperature from October to January, we find a notable increase of Diarrhœa proper in February. It appears that the increase took place in great part in the largely reported District IV, including the greatest proportion of our large centres of population. The number of reports in each month was within one of being the same, there being 74 reporters in January, giving 122 cases, and 75 in February, giving 207 cases. Referring to the meteorological conditions we find an unusual and remarkable similarity in the various phenomena for both months. For instance, the rain (as rain and snow), was 2.75 inches in January and 3.00 inches in February ; the average humidity in January was 83, that in February was 80 ; the average barometric pressure was 30.13 inches in January and 30.14 inches in February ; and the average daily range of temperature, 17° in January and 18° in February, the average highest being, in the case of February, three degrees more than that in January. It will then be seen that, with the exception of this slight difference in temperature, the two months shew practically the same conditions to be in existence. It would seem that in this case so notable a fact must find its explanation in some other causes. Without assuming that the following is a sufficient explanation, it will be noticed that the average temperature of these two months is abnormally low (vide average), and hence it is possible that the prolonged influence of such extremes of cold may have produced effects tending to lessen the vigour and power of resistance of the human system to external influences prejudicial to health. This result has long been considered to be due to the continued effects of the summer heat on the human system, which fact seems abundantly illustrated in the next point to be referred to, viz., the enormous increase in Diarrhœal diseases in July, although, as will be noticed, the average temperature of that month is almost the same as it was in June.

Regarding the second point of the enormous increase in August of those diseases, it will be found by reference to page thirty-nine that 231 cases of Diarrhœa are returned in 57 reports for July from District IV, and 371 in 51 reports for August. The increases in the more largely rural Districts do not show so great a comparative increase. Comparing the meteorological conditions of the two months we notice that the rainfall recorded for July is 4.75 inches, while that for August is only 1.75 ; humidity in July is, however, 76, while that in August is 74 ; the barometric pressure in July is 29.94, while in August it is 30.04 inches ; and the average highest temperature for July is 75.5°, and for August 73.5° ; and the average daily range for the month is 21.5° in July, and about 22.5° in August. Now as we have already seen the increase in Diarrhœa in August amounts to nearly 75 per cent. of the amount present in July ; the average temperature for August is two degrees lower than for July, and the variation in daily range is slight, so that we have apparently only two facts which give a reasonable explanation of the increase. The first is that already referred to, viz., the debilitating effects of continued summer weather on the system, and second, and undoubtedly the more important, the fact of there having fallen a very small amount of rain in August. This dry weather doubtless greatly favoured the decay of organic matter which was aided by the large rainfall in the month of July. A quite remarkable fact may here be noted, namely, that of the absence of any increase in Intermittent in August over that reported for July.

Class III. The diseases of the respiratory organs, under this class, are such as, though having many elements in common, yet possess many other characteristics making it difficult to place them in any satisfactory catalogue. For instance, the rapidity of dissemination, the severity of the onset, and the length of duration of Influenza and Whooping-cough vary so greatly, and the pathological changes and effects of the one are of a nature so different from those of the other that it might be said that little similarity exists between them. Other difficulties might be raised regarding the variation from these shown by Diphtheria in the close relations it bears, as regards causation, to foul air and water, such as might claim for it other relations than those attaching it to this class. Hence it will be seen that while they all have a supposedly bacterial origin, the influence of local more than general conditions as regards some of them would seem to render their classification

for study, in regard to their relations to atmospheric conditions, a by no means satisfactory undertaking.

Regarding the rise and fall of Influenza throughout the year, it may be said that its prevalence shows almost the same proportion to Bronchitis in every month of the year. It would seem to be a natural thing to infer some one of three reasons for this remarkable coincidence: (1) that the clinical relations of the two are so close that the ordinary practitioner is governed very largely by the intensity and duration of the attack as to whether it is reported as Influenza or Bronchitis; (2) that both are of a zymotic character, or that neither is in this sense a specific disease; or (3) finally, that the remarks of authors, such as Bristowe, regarding Influenza in Britain, etc., are not applicable to it as reported in Ontario. Bristowe says: "The obscurity of its origin; the swiftness with which it spreads throughout a district into which it has been introduced, passes from one city to another city, from one country to another country, thus invading entire continents within very brief periods of time; the shortness of its visitation in any locality, its stay rarely exceeding six weeks or two months; the suddenness and completeness of it disappearance; and the irregularity of its epidemic visitations, all combine to render it the most typical of all epidemic affections." While it certainly will be at once conceded that there are sudden outbreaks of Influenza, giving to it, as Bristowe remarks, the character of an epidemic in the most marked degree; yet that this is an infectious disease which has been reported throughout the year, rising and falling with Bronchitis admits of much doubt. For our part it seems that the evident relations of both Bronchitis and Influenza to low temperatures, along with moist, variable weather and high wind, such as those seen in March, are the chiefest exciting causes of both; since by the chilling of the surface by the rapid extraction of the bodily heat in such ways as are seen in the related of experiments by Dr. Smart in the report on Malaria, the lessening of the large amount of blood in the surface capillaries produces internal congestion. It is further against the most extended and recent experiments on the microrganisms of the air to assume that any disease, supposed to be prevailing *in the air*, is likely to be most prevalent during those months of the year during which Miquel has shown the germs of the external air to be present in the smallest amounts. The comparative prevalence of the two diseases is here shown.

SHOWING PREVALENCE OF INFLUENZA.

——	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
Bronchitis (in District IV.)	229	250	278	351	376	692	337	340	197	144	140	207
Influenza (in the ten Districts)...........	417	444	534	614	631	1172	793	473	161	146	90	234

Turning to the other two diseases of this class which are of great importance, it will be seen that neither Diphtheria nor Whooping-cough shows any similar relation, as regards their prevalence, to the temperature, that is shown by Influenza; nor yet do they show any marked connection with each other. Diphtheria, from the great fatality due to it in Ontario, which mortality seems to be yearly on the increase, deserves more than a passing notice. There does not appear in the whole catalogue of disease any, which for a persistent endemicity in every locality where it is introduced, is more remarkakle than this. During the past year there have been few weeks during which I have not noticed, and the public been informed, that the disease had increased in some locality to an almost epidemic prevalence; and inquiry has often enabled me to trace the causation of the first case to unsanitary surroundings. There have been several periods during the year in which the disease has, however, seemed to take on an almost epidemic form over whole regions; and this so suddenly and to such an extent as to almost preclude the possibility of

its being by the ordinary infective process, but led to the supposition that some more or less marked meteorological conditions became the occasion for its rapid increase.

The following obversations of one who experienced the onset and the various stages of an epidemic of this disease, seem to fairly mark some of the more commonly noticed and associated phenomena :

"All remember the prolonged spring of March and April, 1881, fruitful in sore throats, affecting every one more or less. Following April, was an extremly dry and hot May, apparently favourable for rapid development of germs of all kinds. This was followed by a cold June, with rapid changes of air, favouring throat troubles. The active germs thus finding a favourable opportunity rapidly developed themselves. The river has been low, thereby allowing much excrement in which, doubtless, germs have been found, to decompose, while the later dry weather has allowed these and others from the surface soil to float readily in the air ; these have been inhaled, and the disease has spread."

Now if the statements here made were such as mark the ordinary conditions under which the disease is most prevalent, the case would be a simple enough one ; but by reference to Diagram II., it will be seen that there were in different districts, large numbers of cases of the disease at different seasons of the year. Perhaps the most marked increase of the disease was that observed in November in Districts VI. and IX. It has been already mentioned in the study of Table III., that November was the month showing the smallest prevalence of disease. It appears, too, as the month with the smallest average range of daily temperature, or about the same as that of December, which is the month next lowest in the point of prevalence of disease. The humidity of these two months is almost the highest during the year, while with the average amount of rain and snow, the barometer ranged unusually high, having an average considerably above the normal in every district. In district VI. the average height of the barometer was in both months quite phenomenal, ranging from 30.16 in November to 30.19 in December. These points were not again reached in any month or in any district during the year, except in District VI. in January, and in Districts VI. and IX. in February. Further reference will show that, except in March, the average height of the barometer in District VI. was not higher than in several other districts. There are reasons, however, why the barometer should incline to have a comparatively high reading, and why, as will likewise be seen, the humidity in District VI. has generally a high average. But what we wish to especially know is, whether these more or less constant facts have any direct bearing on the prevalence of Diphtheria? Now, it evidently would be undesirable that any dogmatic assertions should be made concerning these evident facts, viz., of the coincidence of these conditions, with what was a great and decided increase of Diphtheria in District VI. (and the higher lands of District IX.). Still, there it stands, apparently beyond refutation, that in those months of the year in which disease, taken as a whole, was least prevalent, when certain associated conditions not present to anything like the same extent in any other months of the whole year, as in November and December, existed, Diphtheria is seen to rise to higher degrees of prevalence than at any other time of the year in this or in any other district.

A few other notes may be given in addition :—

1. It will be noticed that the total cases of Diphtheria, when reduced to the same unit, are not quite as great in November as in October, and considerably less than in December.

2. That the disease was more prevalent in several of the districts in other months, than it was in November and December.

3. That during November there occurred an almost unprecedented magnetic storm, which completely interrupted telegraphic communication for the time.

4. Magnetic displays and electrical conditions of the atmosphere are commonly connected with high barometric pressure.

5. Nascent oxygen and ozone seem to be in amount largely dependent on the influence of the preceding conditions.

6. Following the views of Balfour Stewart, De La Reve and Loomis, the Aurora Polaris ought, all things considered, approximately to constitute a measure of the amount of electricity conveyed to the wind and magnetic poles by the equatorial connecting currents

The conditions under which the quantity should rise to a maximum are not easy to determine. Either an excess or defect of solar radiation may be the cause. Loomis thinks the former. The unusual frequency of the Auroras in the different months of the year depends partly on the amount of electricty present in the upper air, and partly on the humidity of the air by which this electricty can be discharged. Before long, therefore, says Ramsay, we may come to look upon the magnetic needle as a sort of meteorological index, the variations of which may be taken to indicate corresponding changes in terrestrial weather.

7. Though it appears that the barometric pressure of District VI. is highest of any in November and December, it must be remembered that it appears in Diagram I., as reduced to the sea level, and that actually the disease conditions exert their influences at an average heigth of more than 1000 feet above sea-level, (District IV. 500 feet above sea-level.) Hence the air there is decidedly rarer, its humidity greater, as seen in almost every month, and therefore the condition favourable to the conduction of currents of elec-tricity to the soil from the upper charged strata, being most constantly present, it is to be fairly inferred that such an atmosphere is ordinarily more ozonized than those of less heights.

8. The following gives the exact number of cases of the disease taken from Table I.

Showing Prevalence of Diphtheria.

MONTHS.	District VI.		District IV.	
	No. of Cases.	No. of Reporters.	No. of Cases.	No. of Reporters.
October	59	57	48	65
November	101	55	44	78
December	135	48	48	99

8. A reference to the weekly Health Bulletin informs us that it was in the two or three weeks of, and after, this intense electrical disturbance that the greatest increase of Diphtheria occurred.

9. Dr. W. B. Richardson's experiments have shown that a strongly ozonized atmosphere acts as an irritant on the respiratory passages.

10. Inasmuch as these electrical conditions can seem to have no possible favourable relations on the development of Diphtheria germs, since Magnin informs us that ozone causes a definite and almost instantaneous arrest of movement in Bacteria, it would seem that its action if it played any part at all, must have been to act as an irritant to the air passages.

11. In the Weekly Report of Diseases given in the Michigan State Board Report for 1882, I find the following proposition stated :—"That more than the average per cent. of weekly reports stated the presence of diphtheria in months, when the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and average daily range of the barometer, and the average daily pressure of the atmosphere, were greater than the average for the year."

Whooping-cough, the remaining disease of the class deserving special mention, shows in its prevalence an utter disregard apparently for conditions of temperature, since its four highest points are in February, May, July, and August. Dr. Fox tells us that

during hot weather it is rarely heard of in London, while the thirty years' mortality for London shows a rise from January to March ; thence a steady decline to September, when it rises again. Doubtless the statements given here are true, but they show how greatly different the facts actually may be regarding its prevalence from what appear in mortality tables. Now it is well-known that the disease is not so much heard of in warm weather because the mortality is then small ; but taken as a whole in its debilitating effect on children it may be very considerable. We see in these Ontario statistics that the disease may and actually does largely prevail in summer. Indeed both in District III and in District VII it is the months of July, August and September that are most marked by its presence.

Class IV. The general appearance which in various stages of these diseases tends to make them so horrifying to the beholder, has, as much as the fatal character of some of them, made them to be among the diseases the best known and familiar to the non-professional members of the community. In past centuries and the early part of this century the ravages of Measles, of Small-pox and Scarlet Fever, every few years almost decimated the infantile population, especially of those classes whose material condition has made them either unwilling, or unable to take those precautions which, experience has shown, best serve to restrict their prevalence and decrease their fatality. This prevalence and fatality have always been greatest in the thickly populated cities and towns ; but the common assertion by almost every one that they have had Measles and Scarlatina shows their almost unrestricted prevalence still amongst the people. During the past year this class of diseases as seen by a reference to Table IV. may, with the exception of Measles, be said to have been very largely in abeyance throughout the year. Up to the month of February, it will be seen, that while there was from October an upward tendency of the group as a whole, it does not show any such distinctness as would make us claim any special meteorological influence as affecting this increase. In fact it will be seen that the increase belongs in one month mostly to Scarlatina, and in another to Mumps. With January, but especially with February, there began, however, a decided advance in the group, created mostly by Measles and Mumps ; for though, as will be seen, both Small-pox and Scarlatina had been more prevalent than previously, yet Small-pox again disappeared in February, and Scarlatina was less in March. By March, however, Measles had attained its height, and thence declined steadily to the point almost of disappearance in August. Mumps, it will be seen increased more slowly but its increase continued longer and attained a maximum in May : thence the decline proceeded steadily to September. According to English observation, a writer remarks that Whooping Cough seems to progress hand in hand with Measles, increasing with a falling and diminishing with a rising temperature. In these statistics it appears that while Mumps and Measles have gone together the relations of Whooping Cough and Measles have been very slight indeed, for not only do they not show any continuous wave of rise and fall but they also do not appear together in the same Districts to any great extent. The extent to which they run parallel will be clearly seen by reference to Diagram II. It certainly would appear that Measles and Mumps have a tendency to grow less in summer ; and, beginning in the cold weather by infection, to steadily progress till the warm weather sets in. Some remarks on these diseases may not appear in this connection out of place.

From what has been observed by many writers, it would appear that most of the diseases in Class IV. have appeared in Mortality Tables as increasing in the cold weather. For instance, the Small-pox curve of the tables drawn up for London for a period of thirty years by Buchan and Mitchell, show that from January to June the mortality curve is above the average. A similar curve is given as representing the prevalence of Whooping Cough ; Scarlatina varies by having in the second half of the year the mortality curve above the average ; while Measles is exhibited with two maxima and minima, the maxima being at the beginning and end of the first half of the year. It would seem then, that the statistics obtained by this Board for the existing prevalence of those diseases, without any regard to mortality, roughly coincides, with the exception of Whooping Cough, with the London mortality tables, and show that the winter season is on the whole most favourable to these diseases.

From a sanitary point of view this apparent fact is of the greatest importance, though from a biological standpoint, it is at first sight one of much difficulty. The following observations regarding the two may be made:

1. Assuming that each has its specific bacillus, which develops under favourable conditions, how is it that in low winter temperatures those whose activity, in probably every case, is in abeyance, should not only break out but multiply? Are Miquel's statements about the very greatly less number of spores in the atmosphere of Paris in winter, to show that such diseases have no connection with spores? How is it that, with his facts before us, we are going to recognize at once the greater prevalence of these diseases in winter, along with this specific character? Without in any way detracting for a single moment from the important influence of the weather on these diseases, it does seem to me that a much greater matter has in this way been lost sight of. Hence I observe:

2. That let the temperature of the outer air be what it may, either in London or in Ontario, the air in which the specific germs of these diseases develop, is always at a temperature favourable for their multiplication.

Miquel in the following table shows us that in hospitals these germs are much more abundant in winter than in summer; and why? Because they are in a warm equable atmosphere favourable to their development; they are not lessened by frequent change of the air by ventilation, and they have, moreover, abundant and proper food by which to be nourished.

Table showing Bacteria collected from one cubic métre of air at L'Hôpital de la Pitié, Paris.

Month.		Salle Michon. (Men.)	Salle Lisfranc. (Women.)
March,	1881	11,100	10,700
April,	"	10,000	10,200
May,	"	10,000	11,400
June,	"	4,500	5,700
July,	"	5,800	7,000
August,	"	5,540	6,600
September,	"	10,500	8,400
October,	"	12,400	12,700
November,	"	15,000	15,600
December,	"	21,300	28,900
January,	1882	16,100	12,800
February,	"	14,400	11,100
March,	"	14,800	10,550
April,	"	11,120	7,560
May,	"	6,300	5,930

3. These domiciled atmospheres, it will at once be seen, will not be influenced by meteorological changes in anything like the same degree as will the outer air; and hence can be explained some of the apparently contradictory conclusions found, for example, in the next table:—

British Authorities, Regarding Meteorological Conditions Affecting Prevalence of Scarlatina.

F.—Favourable; U.—Unfavourable to the development of the disease.		Temperature.	Humidity.	Pressure.	Authority.
	F.	Moderately low.	Excessive.	Sudden fluctuations.	Dr. Ransome.
	U.	Above Average.		Diminished pressure.	
	F.	Between 56°-60°.	Not above 86°, or much less than 74°.		Dr. Ballard.
	U.	Fall of mean temperature below 53°.			
	F.	A temperature higher than 44.6°.	If humidity of air is less than usual.		Dr. Tripe.
	U.	A temperature below 44.6°.			
	F.	When it rose much above 50°.			Dr. Moore.
	U.	A fall below 50° in autumn.			

4. The fact of the general decline of these diseases in warm weather, while doubtless depending to some extent on atmospheric conditions, especially temperature, depends it would appear, first, upon the fact that the victims of them, notably children, are not exposed, in anything like the same degree, in close, ill-ventilated, and, therefore, filthy houses,—being much in the open air; second, upon the fact that even were they as much in doors, they are not so much exposed, because the temperature allows very largely of natural ventilation, so that the oxidizing influences upon germs can be carried on then much more thoroughly, and hence by means of this ventilation the materials on which they flourish, animal emanations, etc., are not present in at all the same amounts; and finally, children much in the open air are stronger and better able to resist disease.

5. Another point worthy of note is that the much greater mortality from all these diseases in winter does not necessarily mean that they are then more prevalent, since warm weather is much more favourable to recovery from them.

6. The communication carried on with houses affected with some of these diseases directly or indirectly, is the prime and necessary condition of their free spread; and hence it becomes the imperative task of sanitarians, whether medical or lay, to take the most energetic and stringent measures both to educate and compel the people to take such precautions as have been proved most effectual in restricting their spread.

Class V. Passing to the consideration of this class, it will at once appear evident that not only have we a well-defined and distinctive class of diseases, but that we also have diseases which, while they are influenced very largely by weather conditions, yet from their prolonged effects, make it very difficult to determine those months in which they are most prevalent. Assuming that the weather of certain months is most potent in promoting them, it does not follow that these months will appear with the greatest number of deaths from these causes. Thus it appears from the Tables of Buchan and Mitchell that the middle of March has, for London, the highest number of deaths from Phthisis; and that the year shows two maximum periods, viz., from January to the middle of June, and from the middle of November to the middle of December. In New York the maximum of deaths occurs during a period from the middle of December to the middle of May. It

must be evident, then, that the influence of the weather on this disease does not appear with such a prominence as to make its study from mortality returns of much value. The absolute maximum of deaths in March, however, does seem to show that the weather of this month is most fatal to those in advanced stages of the disease. It is to be regretted that Dr. Ballard has not distinctly set forth the varying prevalence in the number of cases of Consumption in his Tables for Islington.

Regarding what appears in Table V. of these statistics, it may be said that while there are some considerable variations in the number of cases of Tubercular diseases reported in different months, there does not appear any such continued rise or fall as to indicate anything like a definite influence of weather on these diseases, save and except that from October to March there are fewer cases reported than from March to September. Oddly enough, the month of August has the highest number of cases, while January, appearing in the first-half year, has the next highest. Of Tubercular diseases other than Pulmonary, July, August and September have the highest number. The character of these months will be remembered. The Ontario Mortality Returns for 1880, however, give the absolute maximum of deaths from Phthisis as occurring in March and November. The influences of soil and climate on this disease in Ontario will, however, be made more evident from a paper on Consumption, Part III. of this report, and by the comparative study of diseases by Districts in succeeding pages of this chapter.

Class VI., including Venereal Diseases, is a class which in a statistical study is important mostly as showing the prevalence of these diseases as compared with other diseases, and thereby getting some idea of their absolute prevalence. While it appears that these diseases were most prevalent from October to February, and again from July to September, it may fairly be said that here the variations are largely accidental. Moreover, from the character of these diseases, it is evident that there is a likelihood of accidental circumstances, such as reports from lumbering districts and those from along railways where large numbers of navvies are engaged, affecting very materially the number of diseases reported at different seasons and from different districts. Their prevalence is, however, very large when we consider that the number reported is really two-thirds that of Tubercular diseases, while the importance of this fact is seen when it is remembered that in London the proportion of deaths from Phthisis alone is one-eighth of all the deaths which occur, one-seventh in New York, and one-eighth of all deaths in Ontario. When we consider the fatal nature of Syphilis, and that it forms about half of the venereal diseases reported; and further, remembering that the view of Prof. Gross is now gaining ground that the scrofulous taint is a variety of the syphilitic, some idea is obtained of what influence upon the national health is exerted by this class.

Having reviewed the six classes of diseases presented in Table IV., making use of the information given in Tables I. and II., in illustrating various points connected with them, it now becomes proper to do little more than refer to the following Diagram I., wherein these six classes of disease are given not only according to their monthly prevalence; but their comparative prevalence, also, according to the reports for districts, is seen. Explanations have been already given of what must appear as exaggerations in this diagram, and of how these have occurred. As, however, the exaggerations, if there be such, are common to each group it will be an interesting reference to watch how, in the Districts, the relative prevalence of the various groups varies.

The diagram has, however, been chiefly arranged to illustrate the comparative differences which may and do occur in Districts in the various meteorological conditions therein set forth, and to show how such differences being present it is natural to suppose that, if disease is at all influenced by atmospheric conditions, influences will be shown in the diseases as arranged in the diagram along with the corresponding monthly and district meteorological conditions.

Without entering into the details of the diagram, a few of the more prominent and apparently constant relations of weather phases on it may be pointed out.

(1.) Examining the *temperature* we find that Districts I. and IX. are conspicuous for the relative smallness of the daily range of temperature, while Districts VI. and VII. have a high daily range. Of the two, IX. in this respect is the most remarkable, having an average daily range usually several degrees less than other Districts, while this average is made up

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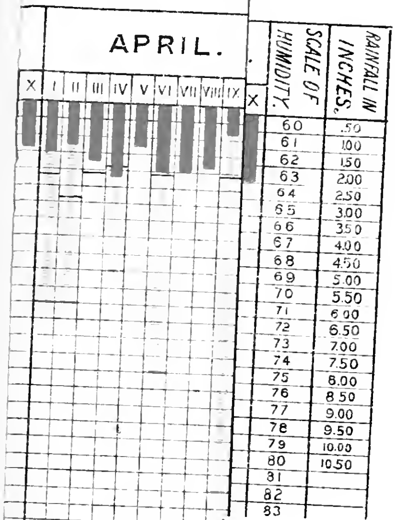

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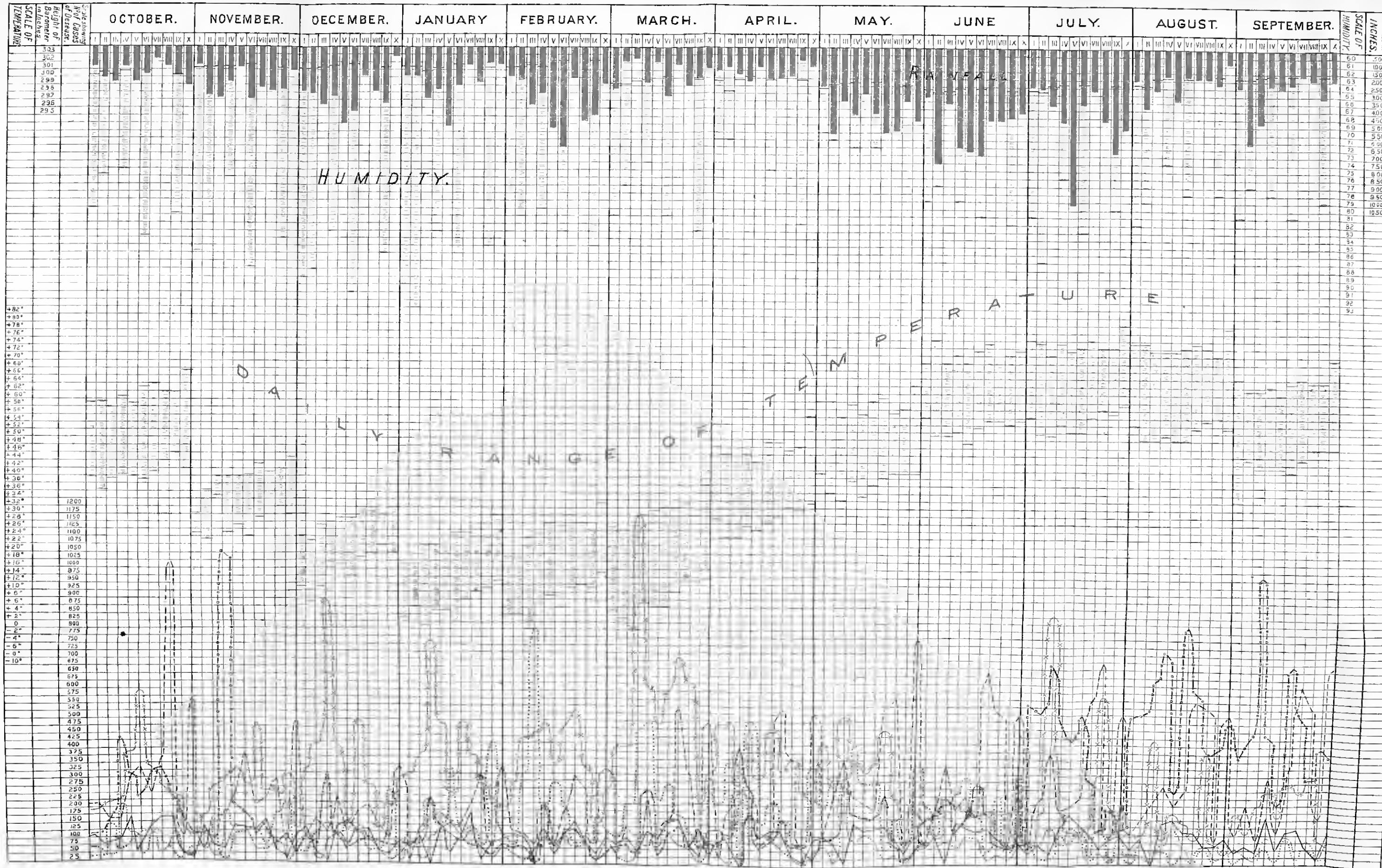
Diagram I representing by month and district, the prevalence of the six classes of zymotic diseases in relation to temperature (showing highest, lowest and mean monthly average) atmospheric pressure, monthly rainfall and humidity (in parts of 100).



Tubercular Diseases, ———— Fevers, - - - - - - - - Diarrhoeas, —.—.—.—. Respiratory Affections, —x—x—x— Eruptive Diseases, ... Venereal Diseases, ————

by the highest not being very high, and the lowest not being very low. The beneficial influence of this fact has shown itself in a most remarkable degree in the culture of certain varieties of fruit, and, presumably, a similar favourable influence is exercised on health.

As IX. is the typical low range district, so VI. is *par excellence* the highest range district. As a rule its average is several degrees greater than the common average.

(2.) Observing that the barometric readings are reduced to a unit or to the sea-level, we again note in connection with these two typical Districts, VI. and IX., that while District VI. shows in almost every month an abnormally high average barometric pressure, District IX. shows an almost constant abnormally low average barometric pressure.

(3.) Regarding humidity it will be seen that District VI. oftener than any other shows the highest average humidity; oddly enough, however, it is District IX. which seems to stand next in point of humidity.

(4.) The rainfall during the summer months being subject to great fluctation, is a fact of less constancy than the foregoing; but, excluding District V., the rainfall in District VI. is higher than in any other, while in District IX. it is not more than an average.

(5.) Another very peculiar point is seen in Districts I. and II., where it appears that, while with few exceptions the rain-fall in them is less than in the other districts, their humidity is proportionately high. The relations of the two in these respects will be seen to be close and remarkably constant.

Such are some of the broad and distinctive differences apparent on an attentive perusal of the diagram. Can we trace any more or less constant effects of these conditions on disease? It is to be regretted exceedingly that in regard to District IX. the number of reporters during the past year has not been so great as to make it beyond doubt that the average taken from the reports received is the true average of disease for the District. It is quite probable that it is, but it is open to doubt. Regarding the large District VI. the number of reports is so great and so well distributed that it may be safely asserted that the averages given are, for practical purposes, the true average for the District. It will be evident to all how great is the importance for scientific purposes of a complete and thorough comparison being instituted between two distinctly different Districts in regard to how disease is affected. It is, however, hoped that as some of these points most desirable for elucidation are presented to the profession the requisite data for good study and comparison will be supplied.

Without asserting more for the correctness of the representations on the diagram that has been already expressed it will be at least interesting to notice a few of the prominent points, which in some cases are, if nothing more, at least strange coincidences.

(1.) *Tubercular Diseases* show in a very marked manner an almost continuous low line of prevalence in Districts I., II., and especially III. The fact already stated may be here recalled that Districts I. and II. (and III. even may be added), have a comparatively low rainfall, with universally high humidity, (as humidity is not returned for District III., evidence on this point is not forthcoming, but analogy would infer its being high there also). It will be recalled that all these areas are not more than 400 to 700 feet above sea-level; that they include all of the Laurentian range of low lying hills of gneissoid rock, and that very considerable quantities of forest especially in Districts II. and III. are still in existence.

It is further of importance to point out that the maximum points of this curve are two, of a constancy so remarkable as to make them unpleasantly suggestive. They are seen in the first case in District IV., and in the second in District VII., and especially in VIII. These unfortunate curves bear a fatal coincidence to the mortality statistics for these districts, as will be seen by the table prepared at my request by Mr. F. Warwick, of the Registrar-General's Department, attached to a paper found in Part III., on Consumption. What the causes are may be matter for discussion; but in District IV. the numerous town populations, and in Districts VII. and VIII., malaria, probably, are important factors in the explanation.

2. *The Fevers.*—Nothing need be added to the remarks already made on Fevers in

Table IV. The curve shows with unfailing constancy the maximum in the Malaria Districts VII., VIII., and in District X.

3. *Diarrhœas.*—With one or two errors of excess in District III., this class of diseases shows very distinctly two maximum curves, the one in District IV., and the other in District VI. The probable correctness of these curves is in keeping with the fact of these two districts being those in which are situated the largest populations, and which contain the bulk of the town populations of the Province.

4. *Respiratory Diseases*—show in a rather distinctive way the two maximum curves exhibited by tubercular diseases, the first being in District IV., and the second in Districts VI. and VIII. (District III. here again shows an error of excess.)

5. *Eruptive Diseases*—as already discerned in connection with table IV., show here just such an irregularity as the nature of the associated diseases and their appearance during the year in localized epidemics would lead us to expect.

6. *Venereal Diseases*—with, perhaps, slight exceptions, show small and unimportant variations in the curves of the several months and districts.

These remarks sum up some of the most salient points in the Diagram. They are in most instances of so marked a nature, as to give us the satisfaction of knowing that some of the problems which we have proposed for elucidation in dividing the Province into districts, have had some degree of light thrown upon them.

Having studied at some length the six principal groups of zymotic diseases in detail, it is now in order to examine some of these diseases separately. As, however, in discussing the prevalence of these groups, it has been necessary to note the place which individual diseases took in making up group totals, there remains comparatively little room for further remark concerning them. In order that those who might wish to follow out, in a more special manner, the prevalence and relations of those diseases, which especially belong to the domain of preventive medicine, I have arranged in tables and diagrams the six diseases—Diarrhœa, Enteric-Fever, Scarlatina, Whooping-cough, Diphtheria and Measles. Smallpox would have naturally been exhibited here, but its very slight prevalence during the year has rendered this unnecessary. Previous Tables show its total prevalence. As already mentioned, the number of reports and cases in District IV. for October has been adopted as the unit to which the other districts and months have been reduced.

Table V., it will be seen has been arranged so as to exhibit in one view the prevalence of each of these six diseases by months and by districts. Diagram II. is illustrative of Table V., being intended to make comparison easy of month with month, district with district, and both month and district together. Diagram II. explains that the squares are divided so as to represent a hundred cases, while the different arrangement of lines serves to mark the hundreds and parts of hundreds of cases of any disease occurring in any month and in any district. By a comparison of the figures in Table V., with the representations in Diagram II., it will be found that in a few instances the number of figures given in the Table is not wholly represented in the Diagram. The reason for this is, that in a few cases, as in District III., the number of cases, when reduced to the adopted unit, has seemed excessive. Why this is, has been already discussed. Hence, because of the technical difficulties which would have been incurred in representing a number of cases exceeding 500, and from the fact of these being in all probability actually sums of excess, 500 cases of any one disease is the highest which is exhibited.

The following are, as will be seen by reference to Table V., the few cases of excess:

1. Diarrhœa.—District III. November has 968.5, July, 540, and September 617 cases.

2. Measles.—District II. February has 740 cases.

TABLE V.,

Showing the comparative prevalence of the six zymotic diseases, Diarrhœa, Fever-Enteric, Scarlatina, Whooping-cough, Diphtheria, and Measles, by months and by Districts.

Diarrhœa.

Month.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.
October	58.5	54.1	353.9	164.0	156.0	151.7	229.4	86.7	89.4	19.1
November	52.8	67.2	968.5	98.3	97.5	67.3	92.4	50.0	58.5	16.8
December	75.4	53.9	277.7	70.9	39.6	48.5	81.2	58.5	40.2	23.5
January	50.6	61.3	208.0	107.1	45.9	44.4	58.8	50.2	28.9	48.2
February	44.7	45.1	....	179.8	32.5	72.4	112.3	81.2	13.0	23.8
March	43.3	60.0	....	218.8	37.6	68.0	120.0	56.2	44.3	31.5
April	68.6	76.6	398.1	211.5	50.0	89.2	149.5	58.3	65.0	18.2
May	87.7	56.6	271.8	153.1	72.2	106.6	195.0	60.5	18.0	20.2
June	127.3	94.9	216.7	78.9	93.9	197.3	168.4	55.0	40.6	42.6
July	247.6	161.3	547.9	263.4	250.7	270.1	207.2	97.5	117.8	86.7
August	290.3	239.3	435.5	472.8	136.5	411.4	355.6	274.8	260.0	291.2
September	247.0	181.4	617.5	268.0	92.9	275.6	355.3	166.7	204.3	218.2

Fever—Enteric.

Month.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.
October	130.0	....	50.5	58.0	169.0	111.7	53.5	65.0	24.4	39.6
November	40.6	30.3	65.0	55.0	78.0	67.4	6.9	20.0	13.0	58.7
December	41.6	14.2	35.5	45.9	31.1	25.2	16.2	....	18.6	19.9
January	3.6	20.4	52.0	21.1	15.3	16.2	....	3.0	21.7	23.1
February	....	25.3	49.0	37.3	....	27.1	....	2.7	4.3	28.2
March	9.3	15.0	55.7	28.7	6.8	6.7	....	....	8.9	14.7
April	....	20.9	....	13.4	....	13.9	....	....	....	2.6
May	32.5	31.5	....	18.9	....	1.3	....	....	3.8	4.5
June	....	14.1	21.7	11.1	3.6	10.4	29.5	7.5	4.1	4.5
July	6.2	4.8	55.7	17.1	32.5	30.4	....	....	16.2	16.2
August	56.3	23.6	19.5	48.4	32.5	65.0	3.8	17.7	26.8	15.6
September	65.0	33.8	40.6	109.5	27.9	104.4	4.3	17.0	83.6	74.4

TABLE V.—*Continued.*

Scarlatina.

Month.	I.	II.	III.	IV.	V.	VI.	VII.	VII.	IX.	X.
October	6.5	37.9	36.1	10.0	91.0	43.3	46.0	21.7	....	2.8
November	24.4	26.0	....	25.0	97.5	50.8	30.8	105.0	91.0	21.0
December	10.4	1.6	71.0	37.4	96.1	44.6	30.2	13.0	74.3	7.2
January	39.2	16.7	....	43.0	214.1	18.4	46.4	38.4	10.8	54.5
February	....	75.8	32.5	32.1	203.1	75.8	3.0	46.0	26.0	....
March	12.4	21.7	....	21.2	37.6	53.5	75.0	22.8	23.6	18.9
April	21.7	18.6	....	20.6	40.0	31.3	13.0	18.0	44.7	10.4
May	35.7	25.1	....	43.0	22.8	9.1	42.2	26.9	19.1	....
June	75.8	7.0	....	16.7	10.8	13.9	11.8	30.0	32.5	4.5
July	12.4	14.4	18.6	33.1	4.6	17.2	8.1	7.2	....	5.4
August	....	35.5	19.5	22.9	....	15.9	....	....	....	5.2
September	3.2	8.1	....	44.5	4.6	37.3	17.3	....	4.6	11.6

Whooping Cough.

Month.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.
October	6.5	89.4	21.7	39.0	13.0	10.2	68.8	....	....	....
November	8.1	144.8	....	19.1	6.5	67.3	....	....	....	8.4
December	36.4	126.8	....	32.8	11.3	46.6	25.5	....	3.1	16.2
January	36.1	83.6	....	25.5	3.8	70.4	37.1	38.2	....	4.2
February	24.3	93.9	....	34.7	8.1	59.6	112.3	19.0	4.3	10.8
March	49.5	41.7	....	28.7	27.4	23.9	107.5	22.8	....	10.5
April	28.8	55.7	....	36.1	25.0	13.9	32.5	42.6	....	....
May	87.7	18.9	....	36.7	61.4	29.9	112.1	....	....	26.9
June	32.5	3.5	108.3	40.9	36.1	18.6	41.4	62.5	4.1	13.4
July	9.3	12.0	399.3	44.5	37.1	11.9	12.1	473.1	....	8.1
August	....	....	416.0	20.4	32.5	15.9	....	195.0	....	7.8
September	22.7	....	146.2	14.8	23.2	42.1	....	175.2	....	7.0

TABLE V.—*Continued.*

DIPHTHERIA.

MONTH.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.
October	32.5	24.3	86.6	48.0	221.0	67.2	22.9	65.0	....	48.0
November	24.3	15.1	6.5	36.6	26.0	119.3	6.8	35.0	91.0	41.9
December	62.4	58.6	53.1	31.5	25.4	130.9	6.9	....	68.0	61.3
January	18.0	57.5	58.5	70.2	7.6	95.3	30.9	5.9	21.6	41.9
February	16.2	99.3	81.2	49.4	77.1	82.3	5.9	21.6	21.6	73.6
March	....	36.6	18.5	31.0	58.1	84.1	....	19.3	35.4	65.0
April	....	13.9	16.2	31.9	35.0	89.3	....	9.0	56.8	39.0
May	65.0	33.5	17.7	28.3	32.5	66.3	87.7	22.4	19.1	42.5
June	8.1	21.0	43.3	31.5	50.5	42.9	26.5	5.0	65.0	40.3
July	3.0	7.2	27.8	27.3	4.6	8.3	24.3	3.6	107.5	35.2
August	4.3	2.9	....	28.0	39.0	36.1	3.8	17.7	11.4	5.2
September	22.7	8.1	16.2	36.9	4.6	57.7	13.0	14.1	23.2	9.2

MEASLES.

MONTHS.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.
October	....	2.7	....	38.0	....	41.0	....	....	....	....
November	....	4.3	....	48.3	....	44.9	....	15.0	45.5	6.3
December	....	1.6	59.1	40.7	2.8	31.0	....	....	127.0	....
January	10.8	....	84.5	53.6	15.3	37.9	34.0	5.9	372.0	14.7
February	....	86.7	747.5	99.6	....	31.4	50.2	....	108.3	67.2
March	3.1	58.3	445.7	430.1	112.9	136.7	77.5	15.8	26.6	113.2
April	....	72.0	....	394.1	35.0	148.6	136.5	6.7	28.4	171.6
May	9.7	21.0	189.1	299.8	75.8	228.8	....	17.9	3.8	221.9
June	13.5	21.1	72.2	197.8	43.3	128.8	23.7	82.5	.. .. ..	235.3
July	46.4	2.4	....	49.1	14.0	59.7	....	97.5	....	48.8
August	....	26.6	....	7.6	....	7.2	....	29.5	3.8	18.2
September	....	8.1	24.4	4.6	....	33.9	....	70.7	....	4.7

Diarrhœa.—As already seen in the study of the Diarrhœa Group, there were marked proofs of their tendency to prevail largely in certain Districts, notably those including the largest centres of population. This is again well seen in Diagram II. Thus District IV. has a high comparative prevalence throughout the whole year, while District VII. comes next. Districts I, II, IX, and X, show a low prevalence of the disease. The immunity of District X. is remarkable, inasmuch as it has much prevailing malaria. But, whatever, be the cause, the constancy of this immunity throughout the year would seem to place the fact beyond doubt and that there is no likelihood of it being an error of defect.

The increase in the disease in July, August, and September is seen with much distinctness.

Fever-Enteric.—The first idea obtained by an inspection of the diagram is that this disease has a small prevalence in the various Districts during the various months of the year. Compared with some other diseases of the Diagram, this is no doubt the case; but nevertheless the fatal character of the disease, makes the death-rate from it, amongst the highest of that from any acute disease. Its greater prevalence in the autumn months is very well shown by reference to the cases in October and September. But, as will be noticed with Diphtheria, the endemic character of this disease is one of its pronounced features. With the exception of a few Districts in the winter months, it appears in every month and in every District. Reference to the Diagram shows, however, that the more populous Districts do not show comparatively a greater prevalence of the disease than others.

Scarlatina.—With a few exceptions, it will be seen that this disease has been present in small amounts during the year. If we except several months in District V. where the disease seems to have prevailed to a considerable extent, its appearance during the year has been, apparently, in localities as an endemic. This may be due to climatic conditions not as yet understood; but following the course of the history of the disease, we may presume that its great prevalence several years ago reduced the number of persons susceptible to its virus.

Whooping Cough.—This disease shows, in a very distinct manner, its character as a contagious zymotic, from its large prevalence in some Districts during several months, while other months and Districts show a complete immunity from its ravages. District IX. well exhibits this in an almost complete absence of the disease from the reports during the whole year.

Diphtheria.—This disease as already remarked bears the peculiar features of Typhoid fever in its persistent endemicity, there having being no month and almost no District in which it was absent. The diagram, however, shows that the autumn and winter had the disease present to a larger extent than the spring and summer months had.

Measles.—Abundant evidence is given showing, by a reference to Diagram II., that this is the contagious zymotic, present to by far the greatest extent, during the past year. Its peculiarly contagious character, or rather the opportunities given for its communication, both from its infective qualities being developed early in the disease and from the disregard in which it is held, have resulted, as will be noticed, in localized outbreaks of an epidemic character. Towns and villages in different parts of the country have been swept by the disease, all susceptible persons having become infected. These results are well seen by reference to Districts IV. and VI. during the months of March, April, May and June.

Diagram II representing the Number of cases of six ZYMOTIC DISEASES for purposes of comparison both by months & districts.

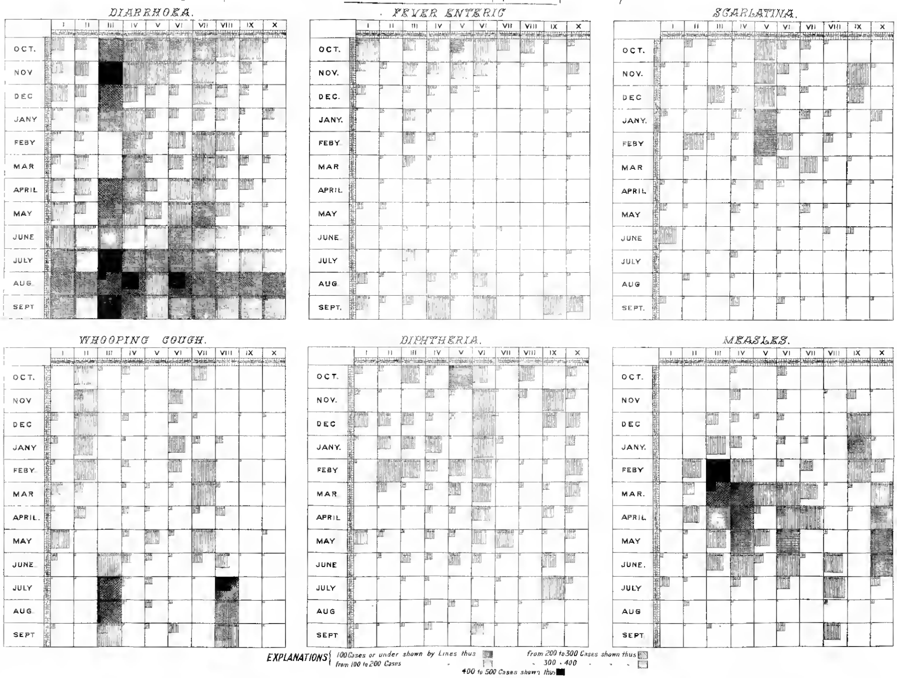


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TABLE VI.,

Representing the Prevalence of Bronchitis by Months, and by Districts.

Month.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.
October........	130·0	81·2	115·6	229·0	143·0	216·7	183·5	21·7	154·4	113·0
November	134·1	138·7	273·0	250·0	149·5	301·4	348·9	100·0	91·0	218·1
December......	184·1	187·1	236·4	278·4	310·9	364·8	401·6	214·5	92·8	278·0
January	242·0	219·1	123·5	351·3	286·6	349·9	514·0	354·5	90·3	327·1
February	158·4	234·7	162·5	376·1	260·0	349·9	747·5	368·3	125·7	329·3
March	250·7	263·3	445·7	692·9	290·8	388·1	730·0	316·2	180·2	421·4
April	231·1	350·5	260·0	337·4	135·0	319·2	565·5	300·4	186·9	228·8
May	162·5	228·5	112·3	340·7	278·1	252·2	513·5	260·0	145·3	255·5
June	140·8	119·5	159·0	197·0	198·6	166·0	271·8	170·0	105·6	159·1
July...........	77·4	31·3	130·0	144·8	139·3	169·8	166·6	224·0	101·6	75·8
August	95·3	106·4	84·5	140·2	208·0	163·2	141·5	165·4	160·6	88·4
September	107·5	119·2	58·9	207·5	120·7	144·4	307·7	180·8	83·6	155·5

But little needs to be added in explanation of the prevalence of Bronchitis as shown in Table VI. As will have been noticed by those who have studied the published Weekly Reports of Disease, Bronchitis has been one of the most prevalent diseases during the year. Though varying very considerably in amount in different seasons of the year, as summer and winter, yet its constant presence must often have been the subject of remark. The rule regarding this disease in Britain, is that it, as well as Pneumonia and Asthma, increases as the mean temperature falls, and diminishes as it rises. This is especially well seen in the London disease curves. In Ontario, however, I find that the same rule is not followed, since the Mortality Returns for 1880 show that March, April, and May returned more deaths from this disease than did February, by far the most fatal of the winter months. The curves in London pass below the average for the year about the middle of April. Regarding the reports of Bronchitis in these statistics, it cannot be said that the same rules as seen in 1880 are very closely followed since there are more cases reported, say in District IV., in January and February than in April and May. The maximum is however reached in both cases in March. The rise and fall is very marked and regular in these returns. Taking District IV. as the type, Bronchitis rises steadily from October to March without a single break, this latter month being by far the most prominent. From March there is an almost equally steady decline to September.

In Dr. Ballard's Table, the average for twelve years of respiratory diseases (not including Phthisis) reported at the Islington Hospital shows two maximum curves, one being reached the second week in January or that succeeding the coldest week of the year, and the other in the third week of November. It is quite evident, therefore, that the winter months in Ontario are, taken as a whole, less subject to the prevalence of Bronchitis than are the same months in England. It will be noticed however that as the month of March is approached or, in other words, as those meteorological conditions are reached which correspond most completely with the cold, damp weather of an English winter, the maximum of this disease is reached. The minimum which is reached in August both in England and in these statistics, is, compared with the maximum, lower in Ontario than it is in England.

Comparing the prevalence of this disease in the various districts as given in the reports, there are one or two points worthy of notice. One of these is the comparatively low prevalence of Bronchitis in Districts I. II. III. and IX. The position of these as

regards Tubercular Disease will be remembered. Similarly it will be recollected that its rise and fall was comparatively small in I. and II. and perhaps III., and that IX. is peculiar in its having such a uniformly small daily range of temperature. The bearing of these facts and their apparent effects in regard to Bronchitis are so evident from what has already been said that repetition is unnecessary.

TABLE VII. *(a)*,

Representing the number of cases of Anæmia for each of the months of the year, corrected to the unit of 224 Reports per month.

MONTH.	No. of Cases.	Totals for months.
October	335·0	6415·0= 5·1 %
November	387·8	6153·4= 6·2 %
December	390·0	6288·3= 6·2 %
January	397·4	6932·2= 5·7 %
February	505·8	7417·5= 6·7 %
March	555·5	8405·2= 6·6 %
April	609·5	8413·8= 7·4 %
May	653·2	7828·5= 8·3 %
June	644·2	6315·7=10·2 %
July	615·3	6859·4= 8·9 %
August	639·4	6944·9- 9·1 %
September	593·9	7131·3= 8·3 %

TABLE VII. *(b)*,

Representing the number of cases of Anæmia, corrected to the number of Reporters from District IV., in October.

MONTH.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.
October	32·5	113·7	16·6	117·0	26·0	130·0	118·5	....	32·5	50·8
November	69·0	132·1	45·5	117·5	39·0	143·0	171·0	10·0	19·5	90·1
December	57·2	128·4	23·6	138·3	110·2	160·0	106·7	22·7	40·2	104·7
January	65·0	117·0	39·0	147·5	137·6	181·6	86·6	65·0	61·3	100·6
February	81·2	162·5	32·5	136·9	150·3	227·5	141·8	75·8	52·0	147·3
March	83·5	165·0	55·7	152·3	167·6	270·5	147·5	73·7	62·0	169·6
April	137·2	232·1	48·7	177·4	140·0	273·9	139·7	121·0	109·6	122·2
May	133·2	192·9	88·6	178·2	169·7	376·3	214·5	125·5	99·4	130·0
June	94·3	159·8	65·0	181·0	148·0	338·9	195·0	62·5	130·0	217·4
July	105·2	91·4	74·2	200·7	236·7	301·1	211·2	86·6	93·4	138·1
August	99·6	138·8	52·0	234·7	175·5	312·0	195·0	88·6	107·0	140·4
September	110·5	140·8	138·1	208·6	102·1	235·7	260·0	62·1	116·0	160·3

In the study of Anæmia, as reported in these statistics, it becomes very necessary that some preliminary remarks concerning it be made. By reference to the diseases arranged in Table I., it will be seen that such terms as Dyspepsia, Degeneration, Senile Decay, Atrophy, etc., are absent from the list of diseases. In some ways this appears to have been an oversight; but when it is remembered that the list is only a partially complete one, and that there is a ruled blank page in the form for reporting extra diseases, it will be seen that the deficiency is thus made up. There is, on the other hand, from a sanitary point of view, a decided advantage in having only this one term under which can be arranged a whole class of cases which occur in general practice, and in which a general debilitated condition, without any special organic derangement, is the expression commonly used for lack of any of a more definite character. The condition is one which is common to all ages, from the atrophic child to the chlorotic girl, and from the tired mother to the decrepit old man. All it tells of hereditary weakness from diseases of various kinds, of imperfect nutrition from insufficient or unwholesome food, of the fatal effects of impure air and bad water, of the too severe labour of boys and girls either in workshops or in schools, of the long-enduring and toiling thousands of mothers, and of the never ending labours of needlewomen, and of those employed in over-stocked trades of many kinds, are sufficiently and best summed up in the word Anæmia.

Jaccoud, in his System of General Medicine, has a class called Constitutional Dystrophias (or malnutritions). Under the head of Chlorosis he discusses the various applications of the term *Anæmia*, and says that the synonymy between these two terms, in being accepted and rejected, has thrown on this terminology a confusion which can only be dissipated by a most rigorous precision. After hæmorrhage there is a loss of blood, or a relative anæmia ; but even this, in an etymological sense, is not exact, since this is not truly an *anæmia* or total loss of blood, but a *hypæmia*. After suppurations and prolonged maladies, or after deprivation of sufficient nourishment, succeeds another *dyscrasia*, and in a given quantity of blood the globular elements are diminished in quantity, and besides, the serum is in excess, and thus there is an *hydræmia*. These diverse forms of Anæmia, he says, are always symptomatic, or secondary. They are preceded by a morbid or hygienic condition, which has for an effect in many instances a consumption of the blood, or a diminution of its formation. Chlorosis, however, is not so diminutive in the quantity as in the quality of the red globules of the blood. It is quite clear, then, from these precise statements of Jaccoud, that Anæmia is a term of very definite character, while the symptoms denoted by Bristowe, as pertaining to it indicate how general it may become in its application. He defines it as "a diminution in the solid constituents of the blood, and in particular of the red and white corpuscles, attended with more or less considerable pallor of the general surface and of the mucous membranes, with palpitation, feebleness, and rapidity of the pulse, panting respiration, sighing and yawning, headache, restlessness, functional disturbance of the sight and hearing, tendency to faint, and general debility, and is a frequent complication or result of many marked conditions."

From this extended summing up, it must be quite evident that, while with almost every specific disease we have anæmia or debility at some stage in its history, it is of the greatest importance that we have, if possible, a term which will be understood as meaning debility, without specific organic disease, and by which we may indicate as much as possible a condition which may be either antecedent to, or consequent upon, organic changes either acute or chronic. Such a term is supplied us in Anæmia.

To obtain some idea of the many factors entering, in greater or less degree, into the causation of this condition of Anæmia, it is only necessary to refer to Part III. of the recent work on Preventive Medicine, by Dr. W. B. Richardson. He there has the following headings for chapters :—

1. Acquired Disease from Mental Agencies.
2. Acquired Disease from Moral Agencies.
3. Acquired Disease from Mental Shocks.
4. Acquired Disease from Imitation, or Moral Contagion.
5. Acquired Disease from Hysterical Emotion,
6. Acquired Disease from the Common Emotions, or Passions.

7. Acquired Disease from Habits of Life. Under this, (1) Of Digestive System, (2) Of Circulation, (3) Of the Nervous System, under which is placed a large number of diseased conditions.

Now, it will at once be seen that in addition to all the Anæmia resulting from acute or specific diseases, and to all the weakness due to hereditary influence, there is another very comprehensive class of causes of disease having Anæmia in every case, as a greater or less consequence of their influence.

Such, then, must in great measure be the explanation of what has appeared strange, viz., that Anæmia should appear amongst the first in number on the list of prevalent diseases. The onward march of Anæmia from the month of October throughout the year, as seen in (a) Table VII., has much interest connected with it. It is there seen that, compared with the total diseases reported, the prevalence of Anæmia is 5.1 per cent. The proportion, slightly increased in November, remains at much the same point throughout the winter months and March. In April its relative prevalence has noticeably increased, and reaches its highest point in June. Thence there is an almost steady decline till September. By reference to the Table showing the total proportion of cases per month for every reporter, it will be seen that there is no marked connection between the two. The only month in which any definite relation between them could, on any supposition, be considered to exist is in June, in which, excepting in November and December, there is the smallest number of cases reported during any month. It will be readily understood that, when there is the smallest amount of acute diseases reported, the proportion of chronic diseases and those of a functional character are likely to appear proportionately greater. Now since we see that June has the smallest total of diseases, it might fairly be inferred that, comparatively, Anæmia and *chronic* diseases would appear higher than they otherwise should. But if this be an explanation of the high prevalence of Anæmia in June, how are we to explain the relatively low prevalence of Anæmia in November and December, months in which the total diseases reported were smaller than in June? It would seem that we have in great measure to search elsewhere for the explanation of this increasing prevalence of Anæmia from March onward. We venture a simple explanation, which will, at any rate, be partially satisfactory. The predominance of disease in March, we have already seen was in large part due to Bronchitis, and Eruptive Diseases; but there was an increase in every class almost without exception. Now, there followed naturally from these *acute* cases, a convalescence in which the anæmic state would be prominent. This doubtless accounts for some of the increase. But what has here taken place as the result of the weather influences of March, must have been at work in a continued, though less marked manner, throughout the long winter months. The debilitating influences of the winter in Ontario are probably not at all adequately understood or appreciated. While it may be true that its influences are healthful on the active and vigorous, who are much in the open air, yet it will be remembered that the smaller children and a large portion of the female members of families keep very largely within doors during the winter. The hurtful influences of this in the case of the wealthy, from close and overheated houses with double windows etc., are very considerable; but these are greatly exceeded by horribly impure air to which large families are often exposed in small houses, in which every precaution is taken to conserve the heat by not allowing the ingress of the outer air. But this fails of its end as regards health. They are often exposed to draughts of cold air, and cold takes effect most readily on their debilitated systems.

These then are anæmic cases, produced by a succession of causes not easily measured, yet in the sum total of their effects very easily apprehended. To these, or rather part of these, may be added, the well-known effects of the cold, damp and changeable winds of March and April on old persons. But it is only fair to infer that these multiplied injurious influences continue producing their effects, as well as leaving the system a readier prey to the many other debilitating causes ever at work.

As opposed to these influences we have the evident fact that in the autumn the healthful influences of its early months, especially October, enable the system to most effectually resist the atmospheric influences which, as regards cold, are beginning to be felt. Moreover, it is well known that constitutions, naturally weak and debilitated, are much stronger at this season than in the spring time.

A glance may now be taken at the prevalence of the disease as regards Districts. As with other diseases, it is found that Anæmia is here and there irregular in its distribution; but nevertheless, in a general way, it follows in the Districts the path which it is seen to do, taken as a whole. Close inspection of the columns, however, reveals the fact, that Anæmia is comparatively most prevalent in Districts IV and VI. The same causes which have been assumed to make several other classes most prevalent in those Districts, have doubtless produced similar effects here. Doubtless the bulk of our town and city populations lies in these two Districts; and there are the many influences which have been mentioned already, as bad food, bad ventilation, absence of the necessaries of life in many cases, all producing their natural fruit in a general debility which too often ends in specific disease.

But while there are other diseases which have not been studied in a detailed manner, but which might be examined with profit, found in these tables, enough has found a place in this statistical study to excite not only a theoretical but a practical interest in the progress of the fatal influences, sapping the foundation of individual, social and national health. What some of the means are which tend to lessen these baneful effects have here and there been touched upon, but further reference to them here is unnecessary, inasmuch as the pages of the Report proper, and the following pages of these Appendices are replete with problems presenting themselves for solution, and with the measures which have been either proposed or acted upon toward this end.

APPENDIX B.

From the many communications regarding outbreaks of disease a few are here given as samples of the work of the Board in this connection :—

Article I.

REPORTS AND CORRESPONDENCE REGARDING SMALL-POX.

(1) Report Concerning an Outbreak of Small-pox at Port Arthur (Formerly Known as Prince Arthur's Landing), Lake Superior.

Telegram from Dr. Smellie.

"Prince Arthur's Landing, Jan. 4th, 1883.

" Dr. P. H. Bryce, Secretary Provincial Board of Health :—Case of small-pox on railway east. Send supply reliable vaccine by first mail.

" Dr. T. Smellie."

The vaccine *virus* was at once sent, and a letter written to Dr. Thomas Smellie to forward full particulars to the Board at the earliest possible moment.

The following most interesting accounts were subsequently received, and give a full description of the outbreak and the action taken towards its suppression. One is given by Dr. Smellie, chief physician to the Canada Pacific Railway, for the Thunder Bay Section, and the other is from Dr. John Clarke, sheriff at Port Arthur.

Dr. Smellie's Report.

Prince Arthur's Landing,
9th April, 1883.

To the Secretary of the Provincial Board of Health :

Dear Sir—On the 4th of January, last, I received a letter from Dr. McCammon, my assistant on the works of the Prince Arthur's Landing and Nepigon division of the Canada Pacific railway stating that a man had died of small-pox, also that he (the Doctor) did not arrive in time to see the man alive, but he had thoroughly examined the body, and had satisfied himself that death had resulted from small-pox. He further stated that he had caused the man to be buried without delay, and had put all the inmates of the camp in *quarantine*. Before his arrival, however, four or five men had escaped, as they had correctly guessed the cause of death.

The man, it appears, had come from Winnipeg, where he had evidently contracted the disease, and had sickened almost immediately on leaving the Landing, on his journey east-ward. Almost a week was consumed in his journey of forty-two miles to Dwyer and Doyle's camp, and he slept in a different place each night of this time. A few hours after reaching his destination the eruption appeared ; and he died a few hours afterwards, his death being apparently hastened by the exposure to which he had subjected himself, and his refusal to seek medical advice.

Within an hour of the receipt of Dr. McCammon's letter, I telegraphed to the Secretary of the Provincial Board of Health, to forward a full supply of reliable vaccine at once, and I also ordered by telegraph, from Winnipeg, a supply of disinfectants of which the village was by accident almost entirely destitute. I wrote to Dr. McCammon to endeavour at once to secure the co-operation of the contractors more immediately inter-

ested to establish a system of permits, and to allow no one to travel from one camp to another without a properly signed order permitting him to do so. Within twelve hours of the receipt of the news I had visited and endeavoured to disinfect every camp at which the unfortunate victim had been known to enter within my particular beat,—twenty miles—and had also forwarded disinfectants for the same purpose to Dr. McCammon.

No action was taken at the time by the contractors referred to. Indeed men were scarce at the time, and all were more or less disinclined to admit that a case of small-pox had occurred—the motive being obvious. Some went so far as to state that Dr. McCammon had not given himself a proper chance to enable him to decide what the disease really was. In addition to this, a local paper mentioned the affair as a mere report, and stated that with due deference to Dr. McCammon it was nothing of the kind. By the 15th of the month hardly a soul in the district believed that small-pox was in our midst; and though I always believed that Dr. McCammon knew what he was talking about I began to hope that we should hear of no new cases; but we were disappointed, several new cases were reported about the 16th, and the disease appeared in a camp five miles distant, and also in the Landing. The former resulted from the hiring of a cook out of the originally infected camp the night before the disease first appeared. The first, and indeed all the cases that appeared in the Landing, except one, were those men who fled from their camps on the first appearance of the disease. It is a remarkable fact that every one who fled from an infected camp was eventually laid low by the disease, while a very large proportion of those who remained in quarantine never suffered from anything but the confinement and loss of time. This may probably be accounted for from vaccination precautions having been taken, (note section 7). New cases appeared from time to time till about the middle of February, since which time no new case has appeared. In all, nineteen cases occurred on the Canada Pacific railway and six at the Landing, of whom five died. The spread of the disease from the originally infected camp was wholly due to the flight of those who disappeared before the doctor's arrival and the establishment of quarantine. Five of the six men who sickened at the Landing, were refugees from infected camps on the Canada Pacific railway: the sixth, my own case, resulted from visiting and prescribing at one of the infected camps.

As soon as the new cases were reported in the middle of January every one took the alarm. The town authorities began to bestir themselves, and Mr. Ross, Manager of the Canada Pacific railway construction works, seeing that the sub-contractors had not been alive to their own interests, took the matter into his own hands and adopted vigorous measures to stamp out the disease. Proclamations were issued and the most stringent regulations were established to prevent all unnecessary travel, and inter-communication between different camps. No one was allowed to travel over the works without a permit, and employees of the management were enjoined not to expose themselves needlessly by attending public places of amusement, etc. All who violated in any way, any of the regulations were to be arrested and placed in quarantine. The Local Board of Health which had been hastily constituted, also issued strict regulations regarding inter-communication between the towns-people and the residents upon the works, but they strangely took no precautions to prevent the arrival of infected persons from the west, nor have any steps been as yet taken to prevent a repetition of this winter's experience when the rush of immigration into the North-West begins to pass by the doors next month.

Happily, when proper measures were taken to stamp out the disease they were successful, and in due time the disease died out; and now two months have elapsed since a new case was reported.

On Monday, April 2nd, quarantine was raised and the forty men, in durance vile, were liberated. Strict isolation was almost the only means used in preventing the spread of the disease. It was deemed impossible to disinfect satisfactorily the infected camps with all their contents including the men's clothing, new supplies of which were furnished to them. The camps are intended only for temporary use, rarely being occupied for more than six months, when they become useless, from the onward march of the work, hence they are cheaply constructed, are built as small as possible and no more spent on them than would make them merely habitable. They are built of logs and the chinks are stuffed

with dry moss, which makes them very warm but also renders disinfection impossible, besides, as the average allowance of space rarely exceeds 400 cubic feet per man, and generally falls short of 200 cubic feet, the difficulties of disinfection were rendered still greater. The total destruction of the camps was therefore decided upon as a means of annihilating the disease, and leaving nothing to chance. Each man, before being supplied with new clothing, was obliged to give up all his old clothes, and to bathe thoroughly in carbolated water. Each man was thoroughly inspected before bathing, and it was also seen to that he bathed thoroughly, each man was dismissed as soon as dressed; last of all the camps were set on fire. The work of liberating the men was concluded on the evening of April 3rd, when quarantine was raised and liberty given to all to go where they pleased. It is the hope of all concerned, that it may be a long time before another out-break of small-pox occurs in this district.

Comparatively early in the out-break I became myself a victim to the disease, so that I can lay claim to but a very small share of the credit of having stamped it out; my assistant, Dr. McCammon, in whose beat the small pox appeared, has almost the whole credit of having visited and prescribed for the sick, a fact all the more creditable to him as he has never had small-pox.

In connection with the disease itself it may be stated that it was preceded by an epidemic of chicken-pox of somewhat severe type; and that a majority of the cases of small-pox were exceedingly mild ones. Still the percentage of deaths was considerable; all who died succumbed to the confluent variety; and only one man who had confluent small-pox recovered. In several cases it was hard at first to tell whether it was really a severe case of chicken-pox, or an exceedingly mild case of small-pox which led to some embarrasment at the outset of the disease. There appeared to be a hesitancy in the assumption by the pustules of the characteristic appearance of small-pox. As before stated the spread of the disease was wholly due to the flight of those who hoped to shun the disease. A suggestion is to be made to the management to clothe sub-contractors and camp bosses with authority to place their respective camps in quarantine, under suspicious circumstances in the future, pending the arrival of competent authority on such matters, and to enable them to prevent the departure of any from their camps, until he has authority to do so. By this means it is hoped to pevent the spread of the disease even if we are powerless to prevent its occasional appearance among us.

Dr. Clarke's Account.

Dr. John Clarke, sheriff of Prince Arthur's Landing, wrote that the disbelief on the part of the people of the Landing in the reported outbreak along the Canada Pacific railway necessitated an investigation of the facts of the case. Dr. Clarke, started from the Landing with the Chief Police Commissioner of the Canada Pacific railway, and, in a journey extending over forty hours accomplished a distance of ninety miles. He visited three camps, in the third of which was the greater number of cases. Assuming time-honoured but worn-out habiliments, the doctor and his companions approached the camps and found nine cases of sickness—two having fatal symptoms—amongst a total of twenty-six men. Having sworn in two special constables, with special instructions from the police commissioner to prevent all persons from either leaving or approaching the camp, the sheriff and commissioner departed, again put on their frozen clothing, and started on their homeward journey, being exposed throughout the whole drive to a temperature of 25° to 30° below zero. Arriving at the Landing in safety they completed, as the doctor graphically remarks, "The most dismal of all rides, and their visit to the most gloomy of all camps." Boards of Health were then organized and actively set in operation at Neebing, Shuniah, and Prince Arthur's Landing, while the clauses of the Public Health Act of 1882 were printed and everywhere circulated along with the directions in the pamphlet issued by the Provincial Board of Health giving directions for isolation and disinfection during the occurrence of contagious diseases. A small-pox hospital was established some three miles from the Landing, to which those attacked, most of them being in large boarding-houses or hotels, were removed. By these means the epidemic was stamped out.

(2) Correspondence Regarding the Outbreak of Small-pox in Peterboro' in March.

The following letter was received from Dr. Robert Sproule, the correspondent of the Board for that section :

Peterboro', April 2nd, 1883.

Dear Sir,—I see by the Annual Report sent on that you keep on hand some vaccine lymph (points I presume). We have smallpox here, and there is in consequence a great demand for vaccination. Could you send me some lymph ?

Yours truly,

Dr. Bryce. Robert Sproule.

On receipt of the above letter which was the first intimation which had been received concerning smallpox in Peterboro ; the Secretary immediately telegraphed to a friend, as to whether the matter had become known in the town, and received the information that there had been, as far as was known, two cases and was directed for further particulars to the town physician Dr. Kincaid. The following telegram was sent :

Toronto, April 5th, 1883.

Dear Doctor Kincaid,—Would you as town physician be kind enough to telegraph particulars of small-pox outbreak and write as to what is being done to suppress it.,

P. H. Bryce,
Secretary Provincial Board of Health.

The following answer was at once received :

Dr. Bryce, 376 Spadina Avenue Toronto.—There were two cases, mild type, both recovered, no new cases, instructed town clerk to write to you. Glad in future to furnish you full particulars *re* public health of this town and county. R. Kincaid.

The following is a copy of a letter from the Clerk :

Clerk's Office, Peterboro', April 6th, 1883.

P. H. Bryce, Esq., M.D.,
Secretary Provincial Board of Health, Toronto.

Dear Sir,—Your telegram was duly received by his worship the Mayor, by whom I am instructed to inform you that there were two isolated cases of a mild type, but that they are all well now, and the town physician informs me that I may safely say that there are no cases in town at present. I remain, yours very truly,

Chas. D. Macdonald, Clerk.

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(3) Report of Small-pox Outbreak near Claremont, Co. Ontario.

The following telegram was the first notice received by the Board of the existence of Small-pox in this locality :—

Claremont, May 28th, 1883.

Dr. P. H. Bryce, Toronto, Secretary Provincial Board of Health :—Send Small-pox nurse on evening train to Stouffville to-night. Answer.

W. F. Eastwood, M.D.

Another telegram was received asking that vaccine be at once sent. This was done ; but it being found impossible to send a nurse immediately to Stouffville, one was secured in the neighbourhood.

On a request from the Secretary that full particulars be given to the Board, Dr. Eastwood wrote as follows :—

Claremont, June 6th, 1883.

My Dear Bryce,—I received your letter and the vaccine in due time. I would have written you sooner, but was waiting until the matter was settled. It was the ob

ject of the railroad men to have the case pronounced as Varicella in order that navvies would not be afraid to come here. They were supported by the other doctor here, who never saw the case, although I invited him to see it. The doctor was the principal cause of the report. To settle the matter the Board of Health for the Township had Dr. Rae, of Oshawa, here, to see the case with me; he pronounced it undoubtedly small-pox, so I think there is no room for doubt. My father (Dr. Eastwood, of Whitby), also saw the case. It is one of modified small-pox, (varioloid.) The patient is progressing favourably. There are no other cases yet, nor is there likely to be any. We have a nurse, and the patient and nurse are perfectly isolated. Please mention this in the papers. Everything is quiet here now. You may mention Dr. Rae was here in consultation with me. You will no doubt hear from Dr. Rae. We cannot trace it to any source of contagion. Any more information I can give you I will do so gladly. Yours faithfully,

W. F. Eastwood, M.D.

As will be seen by the perusal of Dr. Eastwood's letter, the question arose, as it did at Prince Arthur's Landing, as to whether the disease was really small-pox. Dr. Eastwood with an energy and resolution which cannot be too highly commended, at once acted on the supposition of his diagnosis being correct. It was well he did so, and the public owe him a debt of gratitude. His opinion was subsequently confirmed by two old and experienced practitioners, Dr. Eastwood, of Whitby, and Dr. Francis Rae, of Oshawa. The action of other local practitioners who express opinions without grounds therefor, can in no sense be commended since they may, as was the case at Port Arthur, lull the people into a false sense of security.

As illustration of the difficulties which sometimes arise in settling a matter of this nature, we may say, that the railway contractors who were interested, sought to discredit the correctness of the diagnosis made by the Drs. Eastwood; and had the case unfortunately fallen into less energetic hands, it is very probable that even worse results than followed the outbreak on the C. P. R. would have been the sequel here, since the case occurred in a district so much more populous.

Article II.

A REPORT ON THE PREVALENCE OF MEASLES AT DUNDAS.

Information having been received in the report of Dr. A. H. Walker, of Dundas, a regular correspondent of the Board, that Measles prevailed there to an alarming extent, the following letter was addressed to him by the Secretary:

Toronto, March 17, 1883.

My dear Doctor,—Noticing by your report that measles has broken out with an epidemic prevalence in the town, I write requesting that at your earliest convenience you will write stating the particulars of the outbreak. Please state the type of disease, whether there are severe cases, and whether any deaths; whether the Local Board of Health or residents have taken any precautions against its spreading through the schools by closing them, or having the children of infected families isolated from others.

Further give any special personal views as to cases where its spread has been directly traceable to contagion.

We receive with much pleasure and many thanks your regular reports.

With regard, I remain your obedient servant,

P. H. Bryce.

The following is a copy of Dr. Walker's kind reply:

Dundas, March 19, 1883.

Dear Sir,—In reply to your letter of the 17th regarding the epidemic of measles, I may say that it was at first of a very mild form, not requiring medical attendance, but has become more severe of late. During the past week severe complications of bronchitis

as well as a greater severity of all the symptoms have been present. There have been no deaths as yet, though I fear there will be some during the present week. No precautions have been taken by the Local Board of Health, as no deaths have occurred, and people seem rather glad than otherwise to get it over. I cannot find that the outbreak is traceable to any direct contagion. It was so mild at first that one couldn't tell where the disease was, parents sending the healthy children to school while the others were in bed, thus causing the spread of the disease. If ever the epidemic expend its force it will be for want of material to feed on, as nearly every house has been visited. The Board of Health here is a dead letter, I regret to say. Sincerely yours,

A. H. Walker.

Article III.

REPORT OF AN OUTBREAK OF MALIGNANT SCARLET FEVER IN THE TOWNSHIP OF VAUGHAN.

The following is the substance of a letter informing the Board of an outbreak of Scarlet Fever of a malignant character, and requesting that action be taken in the matter. At the request of the informant the names are suppressed :—

——— May 8th, 1883.

Dr. Oldright, Chairman Provincial Board of Health.

Dear Sir,—I wish to call the attention of your Board to the presence, in the Township of Vaughan, County of York, of a malignant type of Scarlet Fever. * * * * * says in his letter, "one case died thirty-six hours after the appearance of the first symptoms, the second case died fifty-six hours after taking it, and two others have it. The first body was kept three days on view to all friends, etc. The funeral was public in every respect, and quite an amount of feeling was exhibited at the absence from it of several of the friends and neighbours. The second case shewed symptoms the Monday after the first; and the two sick now, a few days after No. 2. Now, this shews the grossest carelessness. * * * Some one is responsible for the death of No. 2, and the probable death of Nos. 3 and 4. * * *

Will you be kind enough to have your Secretary distribute freely the circulars having reference to contagious diseases.

Very truly, ——— ———.

In accordance with the request, the Secretary at once forwarded to the Municipal Clerk and others copies of the pamphlet, "How to check Contagious Diseases," and a copy of the Annual Report, with those sections marked which refer to the powers and duties of known persons under the circumstances, and requested that the attention of teachers be called to the provisions of the School Act, regarding the non-admittance into a school of pupils either affected with, or coming from a family affected with, any contagious disease.

A request for fuller information regarding the further progress of the outbreak, and the local action taken in the matter, was asked for, but no such information has, up to the present time, been received.

Article IV.

REPORTS AND CORRESPONDENCE CONCERNING TYPHOID FEVER.

(1) Report of an Outbreak of Typhoid Fever at Niagara Falls.

Suspension Bridge, New York, July 31st, 1883.

My Dear Sir,—I have lately moved here from Clifton, Ont., having been practising in Clifton since February last, being a physician. Since I came here my whole family of

five children have been prostrated with Typhoid fever of a most malignant type. I have lost a daughter—a fine young woman of eighteen years; the other four are now convalescent, and I hope may recover. As doubts here have been expressed that they did not contract the disease here, but in Clifton, you would much oblige me by coming yourself, Chairman, and any others of the Board you choose, and investigate the matter. I am the more anxious, seeing another family is down with it near me. Should you come let me know at once, that I can have the local Boards of Clifton and here to meet you Be sure and let me know at once by post card, and by so doing you will much oblige.

Yours respectfully, ————,

Please be sure and come, and address, ———————— as I have an office there.

A reply was sent referring the writer to the local authorities of Clifton.

Report Concerning Typhoid Fever in ———.

A post-card having been received from ———— enquiring the best means for procuring an analysis of drinking water, stating that Typhoid Fever was present in ———, the Secretary, replying to the first question, requested the doctor to give full information concerning the outbreak. The following is a copy of his letter:—

———, September 15, 1883.

Dear Doctor,—The cases of Typhoid are all at present in one family. Father died in ten days, and now two boys are down, with prospects of one or two more being soon laid up. Supposed cause, the water poisoned by kitchen slops and waste being thrown close to the well, and draining into it. Poor family—attendance a matter of charity—neither themselves nor town would pay for analysis; don't feel like doing it myself, although it would be satisfactory to know. Have prohibited use of the water at any rate, and will await results of fever, whether it spreads or not. Cases are severe, bowels quite loose in all, and temperature up to 104 frequently. Yours truly,

————.

The prevalence of the disease in the town made the necessity for local municipal action so urgent that the Mayor wrote to the Chairman of the Board, requesting that such information as the Board could supply should be sent to aid in the proper organization of a local Board of Health. The Chairman wrote and caused copies of the by-laws drawn up by the Board to be forwarded to the Mayor and Members of the Council. The following letter from states the existing condition and attitude of the Council toward the by-law:—

———, October 20th, 1883.

Dear Doctor,—Many thanks for your kind suggestions relative to legal points of the proposed by-law. I have not succeeded in having it passed by the ——— council further than its first reading. The general objection is to its dimensions, and I must confess it would be more acceptable were it condensed. I regret that some of the members of the council already violate many of its provisions. Hence I anticipate its defeat by mutilation. The Guelph Sanitary By-law of 1881, has many excellent clauses, and is not lengthy. The copies of the by-law have been received by the members of the council, and I feel confident it will assist materially in my efforts to have it adopted as a sanitary by-law for the town.

Yours truly, ————

It affords the Board much pleasure to state that the doctor's efforts in behalf of sanitary organization were successful, in part at least.

The Reported Outbreak of Typhoid Fever at the Belleville Institute.

It having, through repeated newspaper statements, come to the notice of the Board, that an unusual amount of sickness existed in the Belleville Institute for the Deaf and Dumb, and the Secretary having expressed a desire that particulars should be obtained from the Medical Officer, wrote to the Superintendent of the Institute to obtain particulars, when the following letter was received :—

Ontario Institution for the Deaf and Dumb re Provincial Board of Health.

Superintendent's Office, Belleville, March 19th, 1883.

Dear Sir,—In answer to your favour of the 16th, we cannot decide with certainty as to the cause of the Enteric Fever at this Institution, but have an impression the water has something to do with it. I will send you, by express, a jar of water for analyzation. Be good enough to let me have the report of the chemist to whom you submit it, and on receipt of bill, I will remit charges. We have been very particular about our drains and sewers, and have a man whose duty it is to flush them daily with water. This, with keeping the yards clean, is about all he has to do. Our dormitories are large, well aired and ventilated, and the utmost possible cleanliness is insisted upon everywhere. We cannot discover any leakages from the drains into the building. During last summer vacation, every room in the house was thoroughly cleaned, many of them fumigated with sulphur, and the walls of rooms and halls were kalsomined or white-washed. Our milk is from our own and a neighbour's cows, all well fed and well cared-for animals, and their stables are kept clean always. There must be some local cause, and we shall, if possible, find it out.

Up to this time we have had seven cases, all mild. One is quite well, and the others are getting on nicely. As far as we can see at present, none shew symptoms of serious results. Our school work proceeds as usual, and there is no panic, and very little uneasiness among pupils, teachers or officers.

If there is anything you could suggest to us, or if I can give you further information, write me.

Yours faithfully,

R. Matheson, *Superintendent.*

Peter H. Bryce, Esq.
Secretary Provincial Board of Health, Toronto, Ont.

A Report of an Outbreak of Diphtheria at Mooretown.

The following from a very regular correspondent of the Board, was the first intimation that an outbreak of Diphtheria had occurred at the above place :—

Mooretown, October 13th, 1883.

An epidemic of Diphtheria commenced in this village about two weeks ago. The first case, a boy about five years of age, was taken sick Friday, 28th September. The next, a girl about the same age, Thursday, October 4th. Both of these cases proved fatal. I saw the first case five days after infection, and pronounced it diphtheria, and advised isolation and proper care and treatment. The parents could not be made to understand the gravity of the disease, and did not exercise any caution. The second case I saw four days after infection, and found it very bad; an old woman in the village took this case out of my hands. The neighbours went out and in this house; a woman with a large family laid out the corpse, no sanitary precautions being observed. The disease has spread so rapidly that I advised the closing of the schools. It is difficult to trace the origin of the epidemic, but not so to account for its spread.

Yours truly,

————————.

On receipt of the above information, the Secretary of the Board immediately wrote the following letter :—

Office Provincial Board of Health,

TORONTO, October 16th, 1883.

My Dear Doctor,—I thank you most heartily for the information sent in this week's report regarding the outbreak of Diphtheria in Mooretown. I have just written to ————————, the Clerk, asking him to call the immediate attention of the Council to their powers and duties in the matter. I trust that you will succeed in getting the disease stamped out by your energetic efforts. Call the attention of trustees to the clauses 2 (3), cap. 11, part iv, of the School Regulations, requiring the teacher to have a doctor's certificate before allowing children of infected families to continue or re-attend school. I shall be greatly obliged by your sending full particulars of the outbreak, the condition of the village, what is being done, etc. By doing this you will confer a favour on this Board, and myself personally.

With regard, I remain, yours very truly,

PETER H. BRYCE, *Secretary.*

————————, Esq., M.D., ————————.

The following courteous reply was promptly sent by the Doctor :—

MOORETOWN, October 22nd, 1883.

Dear Dr. Bryce,—The present epidemic of Diphtheria in the village of Mooretown, is almost, if not entirely checked. I have not heard of any new cases for several days. It was impossible for me to isolate the infected cases at the commencement of the outbreak, nor could the people be made to understand that there was any danger, until the first two cases died, and the disease spread with such alarming rapidity. One woman, the mother of a large family, laid out the corpse of the little girl that died. She carried the disease home with her, and four of her family have been down with it. The pall-bearers were boys. One of them carried it with him, and seven of his family were affected. The origin of the remainder I have not been able to trace, for there seems to be a tendency on the part of the people to deny everything. I have used every effort to check this epidemic, and advised the trustees to close the school, as the teacher boarded with one of the infected families. It is not re-opened yet. I have advised fumigations with sulphur, and a general cleaning up ; have drawn the trustees' attention to the clause you referred to in the school regulations, and have endeavoured to persuade the people, as well for their own sake as for that of the community, to be careful in carrying out my instructions. The Council have done nothing, and they seem to think that they can do nothing without a report is brought before them to act on. If the powers and duties of a Board of Health are centered in them alone, they are simply *nil* in this Township, for I have attempted before this to have them act in matters relating to the general health, and could get nothing done. The village is situated on ground that slopes towards the river, and is naturally well drained. It has besides, a large sewer running the full length of the principal street, and I find, on enquiry, that a great many of the houses have drains in connection with it. Most of the houses are old, and occupied by monthly tenants, who take no interest in keeping their surroundings clean. The privies attached to these places are never cleaned, and are horribly filthy. The back yards are made the receptacle for bed-room slops and kitchen refuse, besides the hen-coops and pig-pens. The water used all along the front is from the river, and is good. Back from the river the water supply is bad. There are no springs in this section of country, and the water used is collected in cisterns from the buildings, or is what collects in holes made for the purpose, and is always surface water. This accounts for so much malaria in this district —the bad water supply in the country. There are about seventeen cases of Diphtheria still in the village, but are all of the mild type. The main sewer of the village only drains the cellars along the street, and carries off the surface water, and no drains from

privies or back yards empty into it. There are no traps. The main sewer is ventilated, but none of the smaller drains are. I use disinfectants in my own drain from the kitchen, and advise others to do so. I am, very truly yours,

———————

The Secretary, at the same time as the doctor was written to, addressed the following letter to the Municipal Clerk of the Township :—

Office Provincial Board of Health,

TORONTO, October 16th, 1883.

Dear Sir,—From information received from the village of ——— I understand that Diphtheria prevails there in an epidemic form. You are directed to the Sections 15, and following, of the Health Act of 1882, found on page 2, of the Appendices to the First Annual Report of the Provincial Board of Health, of which you have already received a copy. I request that you call the immediate attention of the Council of ——— to their duties under the Health Act, and inform me at once of the action taken by them. You and they will find ample directions of how to proceed in the various pamphlets forwarded to you this year, and in that, on page 68, Appendices of Report. Feeling assured that you will at once perform your duty in the matter.

I have the honour to be, yours very truly,

PETER H. BRYCE, *Secretary.*

——————— Esq., ———.

The following is the reply received :—

TOWNSHIP OF ———, October 30th, 1883.

Sir,—Your communication of the 15th inst., has been received, respecting some cases of Diphtheria in the village of ———, in this Township, and which was submitted to the Council at the meeting held on the 27th inst. No action was taken by the Council in the matter, neither has any by-law been passed in respect to the public health of the people of the Municipality. I am happy to state that the disease is abating, and have heard of no new cases. I am, sir, your obedient servant,

———————, *Township Clerk.*

The Secretary the Board of Health, Toronto.

Comment on the above facts here is unnecessary, as they are referred to in Chapter II. of the Report.

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ARTICLE VI.

REPORT ON MALARIA IN THE LOWER GRAND RIVER DISTRICT.

To the Chairman and Members of the Provincial Board of Health.

Gentlemen :—In presenting to the Board the report of the committee appointed to investigate the condition of the health, as regards malaria, of the region lying more especially along the Grand River, between its debouchure into Lake Erie, near Dunnville, and the site of the city of Brantford, I propose to give to the Board something like a history of malaria as it has existed in one of the oldest—if not *the* oldest—settled districts in Western Ontario, in which the essential fever, known as intermittent, has been extensively prevalent in the past, or is now present to an extent enough to form a very large percentage, indeed, of the total diseases reported to this Board from that District. In addition to this, I intend giving the details of a few experiments made toward the end of examining into the nature of the microscopic organisms found in the air at a point on the river which, as a malaria centre, has an unenviable notoriety. It is very much

to be regretted indeed, that my many other duties have made the preparation and the execution of this work so imperfect, both as regards apparatus employed and time spent. I shall then, without further preface, say, that while in the history of malaria in this district we cannot hope to find phenomena differing materially from those of many other regions whose history we are acquainted with, and though I do not pretend to have discovered anything new having a biological bearing upon the condition of the disease, still, should the results of this commission have any effect in inciting those who have so many opportunities for studying the disease, to extend their enquiries and influence in the direction of discovering remedies for, or urging the adoption of such as are now known; and if, moreover, they can inspire those most seriously affected by it with such hopes and desires for its abatement or extermination as shall end in extended and efficient action, our aim as a Board will have been in this respect to a large extent carried out.

It is desirable, before I undertake a description of the details of malaria as it has existed along this portion of the Grand River, that some remarks be made upon the superficial geological relations of the region.

Underlying the whole region under remark we have stratified rocks of the Palæozoic Age, belonging to the Corniferous subdivision of the Devonian Period, which appears in Canada, again divided into the Corniferous proper and the Onondaga Formations.

Both of these belong to one of the great limestone formations of the continent. As Dana remarks, "these limestone layers sometimes contain seams of hornstone (flint like quartz); and to this the name corniferous alludes. Much of it abounds in corals, as much so as the reef-rock of modern coral seas."

The constitution of these rocks is admirably shown along the lake shore, at the mouth of the Grand River. Regarding the Onondaga division, which may be well seen in the gypsum mines near Cayuga, while the coral fossils are rare, the limestone nature of the rock, with its flinty concretions, is in many ways similar to that of the corniferous proper.

Overlying the rock formation is soil formed of post-glacial deposits, consisting of the whitish clays, known as the Erie clay, which rise to the surface as Lake Erie is approached, and which, as we ascend the river, are overlaid by the reddish clays, intermixed with sand and gravel, of the upper or Saugeen division. As described by Sir W. Logan, the Erie clay was more or less worn before the deposit of the Saugeen clay, hence the latter lies unconformably upon it.

The Erie clay when moist is of a blue color with thin gray bands, more or less calcareous, and holds large boulders and pebbles in greater or less abundance. The Saugeen clay consists of thickly-bedded brown calcareous layers, generally containing but few boulders. The layers of clay, seldom exceeding an inch in thickness, are separated by thin partings of a drab or olive color. Sometimes beds of sand separate this from the Erie clays, and in certain parts it is interspersed with sands and gravels. Regarding the municipalities included in this river region, we may say that they are all included in the counties of Haldimand and Brant; but as the neighbouring county of Welland is under much the same geological and physical conditions we may include it. Speaking in greater detail we have the following account given of the townships of *Haldimand*, *Brant* and *Welland* included in the region under remark, in Appendix B of the Report of the Agricultural Commission, as answers to the questions:

"About what proportion is low, flat, or what is called bottom lands?"

"About what proportion is swampy?"

County and Township.	About what Proportion is Low, Flat, or what is Called Bottom Lands?	About what Proportion is Swampy?
Haldimand.		
Sherbrooke Township...........	None	None.
Moulton "	None—near to good............	Dr. McCallum—1,000 acres of marsh, one-third (10,000 out of 30,000) swampy.
Dunn "	Very small amount—clay, clay loam, black loam...........	Very little—2,000 acres at least.
Canboro "	About 1,200 acres.............	None where land is in good cultivation—large portion.
S. Cayuga "	Hardly any—clay.............	None.
N. Cayuga "	Two per cent.—clay............	About 150 acres.
Seneca "	1,800 acres of best land—clay...	None.
Oneida "	Five per cent.—clay, clay loam, black loam..................	None.
Brant.		
Onondaga Township	Twenty per cent.—clay loam, clay subsoil...............	None.
Brantford "	None—gravelly clay, clay loam, sandy and stoney sub-soil....	None.
Welland.		
Bertie Township..............	None—heavy clay, clay loam...	None.
Humberstone"	20,000 flat—twenty feet to rock.	4,000 acres.
Wainfleet "	One-quarter—gravelly clay, clay and clay loam..............	One-eighth.
Willoughby "	None—peat, clay and clay loam.	Four per cent.
Crowland "	None—clay subsoil	None.
Thorold "	None—clay, clay loam	None of any account.

Hence, regarding the soil, it will at once be seen that the whole district under review consists wholly of post-glacial Erie clays either appearing at the surface or overlaid with reddish Saugeen clays, containing here and there layers of gravelly and sandy clays. Where such do not overlie the clays proper we have in the swampy, flat regions of the eastern townships of Haldimand and Welland immense deposits of vegetable organic matter, as in Wainfleet and Humberstone, taking on in many cases the essential characters of peat bogs. Everywhere, almost without exception, the subsoil or the still deeper layers consist of clay, mostly of a very impervious character: in some cases indeed, its calcareous nature makes it a good water-lime, appearing in trade as Thorold cement.

As the flat district disappears, some five miles above Dunnville the country takes on a more rolling character—the river valley gradually becoming, as Cayuga is approached, a regular valley of denudation, or one which has resulted from the denuding agencies of the river floods in the spring and autumn, and from the rains and snow and frost during the unknown centuries since the deposit of these post-glacial beds.

Hence, taken as a whole, the river valley from the point above mentioned consists of a broad flowing stream, in places a quarter of a mile wide, bordered by flats on either side covered with alluvium deposited by the overflow of successive floods, wearing away sometimes at one point only to be deposited again further down, but always retaining the clay substratum.

Rising from these flats, which vary greatly in breadth at different points, we have what may be termed the old river valley—that is, the depression widening out on either side of the river from a half to two miles, until what may be termed the old level of the post-glacial deposits is reached. In several places we have these deposits almost disappearing, as at Mount Healy where the rock of the Corniferous, or Onondaga formation, crops up.

The gradual rising of the sides of the valley is in many places admirably seen from the old tow-path or river road, which, in many places, passes immediately along the river bank. Irregular everywhere, it is sometimes rising gradually into a sloping upland; occasionally it is a series of undulations, the last always being a little higher than the

previous; or again, apparently due to nothing more than a more tenacious deposit of clay or a change in the river current, the clay rises to a very considerable height immediately along the bank of the river. It will thus be understood that the valley of the Grand river offers many varied and pleasing pictures of river scenery, such as must occur along a stream passing through one of the most fertile tracts of agricultural land of this rich Province of post-glacial clays, sands, and gravels. Indeed the river as seen at several points, as those a mile or two below Cayuga, and for most of the distance between Cayuga and Caledonia, in some parts of which occur small islands in the middle of the stream, completely clothed in a rich verdure, and at other points up the river, notably for several miles below Brantford, presents scenery of an unusually pleasing and attractive character.

Such, then, are the physical characteristics of the Grand River district, and the contiguous part of the county of Welland, with which this report must deal.

It will now be proper to revert very briefly to the history of settlement along the river. As all know, the Grand River was for many years the chief gateway through which settlement proceeded into a large region of Western Ontario. This was the case, not only from the fact that it was the largest river of all this region, but also because its debouchure into Lake Erie is not far from Buffalo, in New York State, whence many United Empire loyalists emigrated after the Revolution. Hence it is that we find in the Agricultural Commission's Report, the statement that the first settlers appeared in all the townships of Welland not later than the year 1790, and in the townships of Haldimand and Brant, at the close of the last or early in the present century. We are not, therefore, surprised at finding this river becoming an important highway more than forty years ago for settlers, either from the neighbouring States, or from Great Britain, journeying, as they did, from the port of New York up the Hudson, thence by the Erie Canal to Buffalo. So far, indeed, had settlement proceeded in this region that forty years ago the Welland Canal had been built; the waters of the Grand River at Dunnville had, by an immense system of dams and weirs, been held back, greatly widening and deepening the river for many miles up, in order that it might supply with water the feeder which enters the Welland Canal at Welland Junction, and had made it navigable for barges and small steamers as far as Brantford with the aid of a number of dams and short canals situated at various points, three of these being between Cayuga and Caledonia, and one at Brantford. The importance of this latter fact from a sanitary standpoint, to be referred to in a later part of this Report, cannot be fully estimated, since it involved the destruction of the forest trees, which had previously grown to the water's edge, over very considerable areas of flats, as well as the creation of permanently broad lagoons, or such as were so, except during the dry season of summer, when the lack of water and enormous evaporation might have turned them into temporary marshes. In addition to this, the water of numerous creeks emptying into the river was dammed back for very considerable distances, while the whole river-water, being permanently raised, caused flats, which hitherto had never been overflowed, to become subject to inundations at all periods of high water, as during the spring and autumn floods, and to have silt and alluvium deposited upon them. We hence see that conditions, wholly different from what had previously existed, were introduced into the region drained by this large river. Along with these changed conditions, there were, of course, superadded the facts that settlement and clearing were always going on, in most cases directly along the river banks, and also that decomposition of the organic matter of the virgin soil was going on at all points around settlements.

Turning now to the past history of malaria along the river, I have found it practically impossible to get any definite information extending back much beyond forty years, concerning the prevalence or non-prevalence of the disease. It is only since the dams, already spoken of, were built that history speaks out very decidedly concerning the disease, and then it is in such language as gives us some idea of what malaria has ever been along the valley of the Grand.

I obtained information from individuals at various points along the river, and it will suffice if I give the statements of a few. Quoting from a brief report which Dr. G. A.

McCallum, of Dunnville, who has practised medicine there for sixteen years, has been kind enough to prepare for me, we have the following :—

" No doubt, in former years this locality was a veritable Eden, *à la Dickens*, when it it is said by the old inhabitants, that there were hardly enough well persons to nurse the sick."

Judge Stevenson, of Cayuga, a worthy old gentleman, who has lived for many years on the river, spoke most feelingly on the subject. He said that when he first went up the river (about the year 1846) its malarial condition was something beyond conception. Everybody had the ague, and, at times, it was difficult to find enough well persons to perform the ordinary work. Similar testimony was given by Dr. J. Baxter, M.P.P., of Cayuga, who has lived on the river some twenty-six years. In conversation with an old gentleman—Charles Smith, Esq., of Newport, near Brantford, the point on the river where the heavy clays largely disappear—I was informed that when over forty years ago he first settled on the river, it was fordable opposite his residence, and that an ox team could be driven across. Then the river seldom overflowed its banks, and malaria was absent ; but he said that when the Caledonia dams were built, whereby the water was held back, deepening the riverway a very considerable number of feet and causing the banks to often overflow in the wet seasons, ague became very prevalent.

From this unanimous testimony we can draw only one inference, and that is, that the appearance of malaria of so epidemic a character along the river immediately subsequent to the building of the dams, establishes between them close relations of effect and cause, (at least the existing cause). The history of the disease since that time has been interesting. Concerning it Dr. G. A. McCallum again speaks very definitely : " The fever there (*i.e.*, in the earlier history of Dunnville), assumed quite a malignant type —real typho-malarial. Now, however, thanks to a system of drainage, mainly adopted since the Ontario Drainage Act came into force, not only is the character of the fever changed to a mild Intermittent, but the number of the cases is not one-fiftieth of what they were."

Again Dr. F. King, of Port Colborne, speaking of the disease and the district lying back toward the great marshes of Wainfleet, testifies to a marked decrease of late years as the soil has dried out and its excessive organic matter been lessened by cultivation. His opinion is that the type of the disease has become milder, the old congestive type having in most cases assumed more of a remittent character. Statements of a similar character have been made by Dr. Baxter, of Cayuga, Dr. Dee, of Tuscarora, (the Government physician to the Indians), and by Dr. Marquis, of Mohawk, whose practice lies at the upper end of the malarious district. But, while relatively there can be no doubt but that malaria has greatly lessened its extent and potency along the valley of the Grand, still from many causes the absolute prevalence of the disease in the region continues to be very great.

TABLE I.

Giving the total diseases reported by the before named practitioners from their respective practices, and also the number of cases of Intermittent and Typho-Malarial Fevers.

MONTHS.	Dunnville.			Caledonia.			Tuscarora.			Mohawk.		
	Fever.			Fever.			Fever.			Fever.		
	Int'nt	Typ'o	Total.	Int'nt	Typ'o	Total.	Int'nt	Typ'o	Total.	Int'nt	Typ'o	Total.
October	24	1	94	24	15	335	90	....	123	....	....	....
November	9	...	82	36	6	351	40	....	70	....	....	....
December	14	....	129	31	9	387	27	....	93	....	....	36
January	5	....	91	30	2	396	30	1	95	11	...	62
February	8	....	72	53	7	670	37	....	96	11	1	117
March	23	....	174	132	3	760	76	....	147	5	....	96
April	19	....	101	114	....	486	56	....	101	3	....	43
May	32	....	118	88	....	458	69	....	129	15	2	154
June	26	....	103	121	2	468	75	....	197	3	....	38
July	21	....	99	84	1	269	67	....	147	....	....	....
August	26	....	108	83	1	310	22	....	97	29	....	135
September	45	....	150	86	...	403	68	.. .	133	10	....	54

TABLE II.

Giving the percentage amounts of Intermittent Fever of all the cases reported

MONTHS.	Intermittent Fever Reduced to 100 (for comparison).			
	Dunnville.	Caledonia.	Tuscarora.	Mohawk.
October	25	7	72	..
November	10	10	57	..
December	10	8	29	..
January	5	7	31	17
February	11	7	38	9
March	13	17	51	5
April	18	23	55	3
May	26	19	53	9
June	25	26	38	7
July	21	31	45	..
August	24	26	53	21
September	30	21	58	18

In discussing the problem of why there should exist so great a prevalence of malaria along the Grand River, even along the upper before-mentioned portion, at the present day, I am perfectly aware that I am undertaking the study of a question which has occupied the attention of many of the most prominent men of science, physicians and sanitarians of the present day. But as every new study may elucidate some point hitherto in doubt, and as every region presents some physical characters peculiar to it alone, the study of the malaria of the Grand River is adding the evidence of another witness to the testimony of the many who have already written on the subject. As all are aware a great deal of exact information has been collected on the subject by the united efforts of the Health Boards of several States, in conjunction with the late active National Board of Health of the United States. There the question has largely been, not one of explaining why the malaria of an earlier day still prevails, but one of how malaria has appeared in districts in which, while the country was much nearer its primitive original condition than it now is, malaria was unknown. A similar question presents itself in many localities of this Province at the present time.

In connection with these numerous investigations it would seem as if almost every conceivable factor entering into the formation of a conclusion had been obtained. Indeed, in many instances the fox has been driven to his last cover; all are perfectly sure he is there, and yet he has not been caught and killed! In fact the task of the mythical Perseus when he slew Medusa about to destroy Andromeda, was a much easier one than this of the scientist and sanitarian, since Medusa had the one great virtue of being large enough to put hands upon; but the malaria demon is worse than Medusa, for it is a hydra and more than one hundred headed.

In the region we have under review two distinct phases of the problem seem to me to be present. *First*, we have a large swamp region—an immense flat tract of many miles' extent—either in its native state or brought more or less perfectly into cultivation, through parts of which two large canals run; and, *second*, we have a river region, which, with the exception of a few miles at the mouth of the river, and one or two small areas up the stream, near Cayuga, is perfectly free from swamp. Now, with regard to the first, we may say that we have present every condition which the experience of all ages and every country has shown to be productive of malaria in its typical form; but, with regard to the latter, we have a condition of things which at first sight seems to defy the application of ordinary well known facts to its phenomena. Yet this latter case is in many of its particulars exactly the same as that presenting itself for solution in many of the Eastern States.

Amongst the many assumed immediate causes of malaria, the following may be named as having their respective adherents:—

1. *Marsh Miasm*—air from the marshes—comprehensive enough to take in almost every other assumed cause; and yet indefinite enough to mean nothing. It is one of those terms which makes us feel comfortable by tickling our fancy with the idea that we are very wise; and yet it is one of those words which some good old monk, probably of the Roman Campagna, happily coined as a cloak for his and our ignorance.

2. That it is due to the pollen from various plants, such as Palmella.

3. That it is due simply to cold. (See Surgeon-Major Oldham's "Malaria, What is it?")

4. The resurrected and rehabilitated idea of some Rip Van Winkle, put prominently forward with much ingenuity and assurance in the August number of the *Popular Science Monthly* by Dr. A. F. A. King, of Washington, to the effect that a proboscidian member of the august order of dipterous insects, known as the common mosquito, is the all-efficient agency in injecting—we are not told what—the something that causes intermittent. As set forth by Dr. King it opposes the recently expressed theory, which ascribes to this same savage of the forest primeval the virtues of the medicine-man from the fact that he injects, not malaria, but the quinine which cures malaria.

5. The gases which result from the decomposition of vegetable organic matter.

6. Finally, we come to the modern and increasingly probable theory which ascribes the origin of malaria to a *microbe* or *bacillus*, of a character peculiarly its own, by which, when introduced into the blood it multiplies very rapidly, producing alterations in blood constituents and so causing the fever.

Now, assuming that the probabilities as to the cause of malaria are in favour of that which will best fulfil the requirements of the case, we must suppose that malarial regions develop certain *microbes* or *bacilli*, which, when introduced into the human system, produce Intermittent Fever. It would hardly seem to come within the province of this paper, to discuss the various other theories which we have stated, simply because none of them, in any degree, seem satisfactory explanations of the causation, although they may serve in part to aid in explaining how the supposed specific *bacilli* produce their effects. It must be evident to all, that on the assumption of the zymotic origin of malaria there must still exist along the Grand River valley conditions which favour the development of the specific germs of the disease. What the conditions favouring this development seem to be, it now becomes our duty to enquire. Knowing, as we do, that the air everywhere contains to a greater or less extent microscopic organisms, both of an animal and vegetable nature, it will not appear strange that the air in such a locality as that in question should do so likewise; but what we have to try more especially to determine is, why should this locality continue to produce and distribute germs of this specific character?

It need hardly be said that, whatever conditions are now present along the valley of the Grand, those in its early history were eminently those which characterize the places where, in all climates, malaria has been usually epidemically present, viz., those where the abundance of decaying organic matter, which had lain along the river flats and at the mouths of creeks had been kept moist by the high waters caused by the dams, and hence, with their drying up, the conditions most favourable for the rapid growth and development of all low forms of vegetable life were present. The question, however, of how much organic matter need be present, and how much moisture, in order that the conditions favourable for the rapid development of malaria may exist, has long been a disputed problem. Allow me here to give a few examples of various conditions, all of which will, I doubt not, show that, whether at the level of the sea-shore, in the marshes along the lake or river, or whether in some upland valley even to great heights in the mountains—moisture has been present to a large degree in the presence of much or little organic matter. Indeed the very names "marsh fever," "jungle fever," "hill fever," and "mountain fever," aptly illustrate this fact. For instance, we have (1) the historic fens in Ely, in Lincolnshire, which, till within some twenty years, were notorious breeding-places for the disease; (2) the central inland depression of Sweden around Lake Wener has malaria endemic there; (3) the valley of the Lower Danube so subject to overflow, is pestilential from the prevalence of the disease. In fact all experience shows that marshes, deltas, estuaries, and such as are liable to be inundated are the most malarious. But we have another much more unusual, hence more interesting, number of examples of the prevalence of the disease, such as the following:—

4. In Asia Minor and the Euphrates valley, malaria has taken possession of large tracts of land that must have been formerly highly cultivated but are now treeless, barren and even marshy.

5. Again we have examples, such as the Roman Campagna, of tracts which have gone out of cultivation becoming clothed with pasturage, and yet are extremely malarious; whereas, as in this case, it is impossible to believe they could have been in the olden time other than salubrious, since, for instance, Ostia and Paolo, on the sea cost, were in those times the favourite resort of the rich. A peculiarity of the Roman Campagna in this connection is, that the greater proportion of it consists of hills, rising more or less regularly towards the volcanic ranges of mountains, to the north and to the south.

Besides these two classes, there is another class of places, which now and then seem to be markedly malarious, although they possess characters in many ways the opposite of the foregoing.

6. Thus barren rocks, such as the Ionian Islands, Hong Kong, and De Los Islands, near Sierra Leone, are historically malarious.

7. High, and more or less barren table-lands, such as the Deccan, Persia and New Castile, are malarious.

8. Mountain regions, as in the Andes and Rockies, give rise to the so-called mountain fever.

A certain other class of limited areas have undoubtedly been infected with the

disease, as those in which saw-dust and lumber, in a more or less decaying state, have been present. Indeed, a case is cited in the British Encyclopedia, where the disease broke out on shipboard, the cargo consisting of deals from the Baltic, while the bilge-water about it had become putrid. I have, by these selected examples, endeavoured to show the varying conditions under which the disease prevails; and in them all there seems to be but two necessary conditions, viz.:—organic matter and moisture. Heat, however, is an element which must not be forgotten in this connection; since, if we refer to the examples given, it will be found that they have all been in tropical, subtropical, or temperate climates.

Objections have been raised against this method of generalizing, from the fact that there are districts with all the conditions present apparently most favourable for the development of the disease. For instance, the valley of the Amazon possesses a comparative immunity from it. In such it will doubtless be found that explanations, more or less satisfactory, could be given, explaining why the germs of the disease do not find in them a favourable *nidus* for propagation; or, if not, then on the theory of a specific microbe, it would be sufficient to say that such had not been introduced, and, hence, could not be propagated, on the principle laid down in the axiom *ex nihilo nihil fit.*

But it will now be evident that the conditions present in every case, where the disease prevails, are those which cryptogamic vegetation, or that of lower plant life, finds favourable for growth and development. Bacteria being organisms composed of protoplasmic contents, and an outer cellulose envelope, must, like all the inferior organisms, receive nourishment by endosmotic absorption. Hence, although it is true that different forms are found to prevail in certain solutions, or in certain substances, it is equally certain that all, as Magnin says, "must have water, nitrogen, carbon and oxygen, as well as certain mineral salts, which enter, but in quantities exceedingly minute, into the chemical condition of all organized bodies." As there is no district, even deserts of sand, with a total absence of organic matter, it might be inferred that the discussion of the question of how to prevent malaria is at an end, since it ought to be ubiquitous. But it is not, and we have to attempt to patiently enquire into the reasons why there is in some districts an immunity from the disease.

Now, the first and almost self-evident truth is, that the number of germs of the disease must vary (*a*) in different situations and (*b*) under different conditions.

Let us briefly discuss this statement. Other things being equal, the soil best suited to their growth, as to that of all other vegetation, will produce them in the greatest abundance. This is not only true theoretically, but is capable of being proved. For instance, Pasteur has shown by sowing sterilized solutions with the dust of the air, that the air of the plains is more charged with spores than is the air of high mountains. But this method would only enable the number and character of such as are capable of multiplying in the culture solution to be known: hence, as Miquel says, "the only accurate way of gaining an estimate is by counting them under the microscope; for, although by the latter method we run the risk of counting as germs, unfruitful spores and those killed by age and dying out, one does well not to forget that a large number of the seeds of lichens, of algæ and mushrooms, though being perfectly alive, never multiply in *wort*, the juice of fruits and the broths where some moulds of the *Mucedines* and *Mucorines* disport and multiply themselves." Thus, for instance, I take from Miquel on "Les Organismes Vivants de l'Atmosphère," p. 52, the following table:

	Spores of Cryptogamia.			
	Young.	Old.	Pollen.	Mineral Particles.
1. In Summer.				
" Wet weather.	Numerous.	Rare.	Frequent.	Rare.
" Dry "	Rare.	Frequent.	Frequent.	Abundant.
2. In Winter.				
" Wet weather.	Rare.	Rare.	None.	Rare.
" Dry "	None.	Frequent.	Very rare.	Abundant.
3. In Hospitals and houses.	Very Rare.	Frequent.	Very rare.	Very abundant.
4. In Sewers.	Numerous.	Rare.	None.	Rare and homogeneous

We have in the above table such indications well illustrated. The number of spores, either new or old, varies with the humidity of the atmosphere. Again they vary accord-

We thus see that there are definite laws regulating the number of spores and their vitality. In the external air in summer we have abundance of pollen and of spores, new or old, varying according to the degree of dampness or dryness of the atmosphere; while, as opposed to this, the pollen and new spores are rare in houses and hospitals, although old spores may be abundant. Again, in the sewers, new spores are numerous while the old are rare, and pollen is wholly absent.

The remarks here made concerning the spores of Cryptogamia must, as far as we can judge from the nature of this whole class of plants, and from analogy, apply equally to those of Malaria, (let us call it Bacillus Malariæ). The next point is that their number must vary with changing conditions.

In these quotations, it will at once be evident that we possess an invaluable amount of exact information, the result of extended information which has a very direct bearing upon all parts of the question at present under consideration. Having, then, seen the conditions upon which the propagation of schizophytes seems so largely to depend, it seems best to apply them to the examination of our present subject, by taking up in detail the phenomena, apparently present in the water, soil and air of the district along the Grand, and the low areas of Welland county, bordering along the canal and its feeder.

The waters of the Grand. We have already stated at some length the characteristics of the river, its banks and valley, as well as of the flat townships of Wainfleet, Humberstone, &c. Regarding the water of the river, we have a stream, which, as it flows through the clay soils from Brantford downward, is generally somewhat contaminated with suspended clays worn from the banks. Otherwise the stream flows with ordinary rapidity, and maintains the great body of its water always in a fresh condition. Nevertheless, the lagoons and mouths of creeks always contain water, which becomes in a large degree stagnant, spread out over these shallow surfaces. It will at once appear evident that such areas will not only have become largely covered with the organic and mineral matters which were contained in the water, and which have gradually sunk to the bottom of the quiet water; but will also have growing there, in many cases, the coarser grasses and many sub-aquatic plants, such as equisetæ, algæ and confervæ.

Such are the conditions which, seen to be in some degree existent in early summer, will in ordinary seasons go on increasing in the later summer months, since the frequent dry seasons by lowering the general height of the water, assisted by enormous evaporation, will gradually cause these surfaces to become intense with vegetable life in the drier parts, and in the more moist portions to be surfaces of mud made up largely of organic matter, which, undergoing rapid decomposition, gives off odours pregnant with the gases of putrefaction, and which, as Miquel tells, becomes capable of yielding up

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ing as the season is winter or summer. We here see that proximity to abundance of decaying organic matter, moisture and heat are the principal conditions regulating the rarity or abundance of malaria germs. But in this connection it is well that I quote some further remarks which have been made by M. Miquel as the result of his lengthened observations. He says: " In calculating every day the number of atmospheric bacteria with the precautions already described, one is not slow in perceiving that the numbers obtained are variable much more even than those of the cryptogamic spores of moulds. In comparing the mean results found, by the week, by the month and by the season, with the temperature, the state of dryness and humidity, it is easy to seize upon constant relations between these numerical results and various well marked meteorological conditions. In general, the number of bacteria, little increased in winter, increases in spring, remains high in summer and falls rapidly in the autumn; this is at least what appears to result from the general mean deducted from monthly means, obtained during three years at the observatory of Montsouris, when the winter decrease of the number of microbes is always marked with much distinctness.

(A table inserted in the text at this point gives the relations of the number of bacteria to the temperature throughout the months of the three years 1880-81-82.)

to the atmosphere dust laden with the spores of schizomycetæ along with those of the mucedines and other protophytes at the moment the surface becomes dry.

It will very readily be understood that the variations in the amount of such germ-producing surfaces will depend largely on the following conditions:—(*a*) The height of the spring floods and the extent of surface covered with readily decomposable organic products; (*b*) the amount of rain during the later spring, and the summer months; (*c*) its regular or irregular distribution throughout the different months; and (*d*) the intensity of the summer heat, on which so largely depends not only the amount of evaporation which takes place from day to day, but also the amount of decay going on in the organic matter, which, in other terms, represents the degree and amount of development of the bacteria of fermentation and putrefaction.

How delicate is the balance which regulates the amount of bacteria that are carried into the air is seen in the facts which repeat themselves again and again in Miquel's tables. A moist season followed by a dry one of sufficient extent to allow of the drying out of such surfaces, always shows a proportionate increase in the bacteria of the air; but let the drought continue long enough to cause a drying out of the germs, by the absorption of their water by the air, and their amount proportionately decreases. It will readily be seen, however, that such surfaces as those along streams dammed back will always have a new germ-producing surface, since no matter how long the drought continues there will always be the wholly dried surfaces and then every degree down to the surface covered with water. Hence it is that, on the assumption of the zymotic origin, of malaria, there will always be a never failing hatching place for its germs along such streams; and there, under such circumstances we would have an alteration of the effective germ-producing period noted by him as increasing after rain, but soon lowering with continued dry weather—and which his statistics shew to be the rule at Montsouris. Under such circumstances the lateral distribution of microbes from their source of origin will depend, (*a*) on the amount of their production; (*b*) on the rapidity with which they are dried out in a fervid summer atmosphere; and (*c*) on the breadth and height of the valley and the number of obstacles which mechanically oppose their lateral spread.

As, however, each one of these points deserves extended notice, and, inasmuch as they are such as are common to the subject of Malaria, in its relation to the soil proper, it will be well to defer their discussion to a subsequent part of the report. We have now to briefly take up what is at least as interesting a part, and certainly a more difficult part, of the subject, and that is the consideration of:—

The phenomena peculiar to the soil of this flat district, and, more especially, the valley of the Grand. It will readily be comprehended that there are difficulties attendant on the exact study of the germs which exist in the soil to a much greater extent than is

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One sees at once here the number of bacterial spores, very greatly elevated in October and November 1879, fall rapidly with the temperature, then rise again, till in May, 1880, it is even with the above; but, thereafter, while the heat increases, passes through two close maxima, the number decreases considerably and passes through two remarkable minima with the months of June, July and August. In September and October, 1880, the microbes become very numerous, then their disappearance strongly marks itself with the approach of winter.

In 1881 the agreement of the bacterial curve and of mean temperatures is manifestly evident. In 1882 the contrary is absolutely true; the atmospheric microbes diminish in proportion as the temperature augments. In June one sees at Montsouris the monthly minimum mean of the ten past months. Thus the increases and decreases of ærian microbes, observed in the year 1881 to 1882, are twice out of three times in pronounced disaccord with the march of temperature. The variations here are evidently governed by other agencies; experiment demonstrates that dryness and rain have on them an all powerful action. To give proof as to the action of rain on the number of ærian schizophytes it suffices to reproduce here a diagram in which the results—weekly means of the statistics of microbes—are represented by a full line broken very sharply, and the amount of the rain fallen during the week by rectangular vertical spaces marked black. Each horizontal line represents at once 2·5 m.m. of rain and 25 bacteria per cubic metre.

the case with those of either air or water. While the analysis of the nature of the air and the measurement of the amount of water in the soil have, as we shall see, been the subject of considerable study, I am not aware that any extended experiments have been made upon it.

Miquel has indeed done in this direction much work, but, as he remarks, he has not pursued his studies so long as he could desire. He says: "The microscopic analysis of soils practised at Montsouris Observatory are not yet sufficiently numerous to permit me to establish with certainty the laws which regulate the appearance and disappearance of bacteria in the soil; according to previous experiments, their number in it would be dependent upon the *seasons, rain, dryness,* etc.

"Following the depth and nature of the layers of the soil, this or that class of microbes would appear; briefly, there remain on this subject numerous interesting facts to be set forth, and I shall spare nothing in carrying out my investigations in this direction.

"The soil is generally rich in schizophytes. The analyses effected on several specimens of *humus* taken from a grass-plot at Montsouris and from Gennevilliers show that the number of *microbes* capable of returning to vital activity again (*rajeunissable*) in neutralized *Liebig* broth, finds itself in the neighbourhood of 800,000-1,000,000 per gramme of earth dried at 30° C. during forty-eight hours.

"The organisms the most distributed throughout the soil belong to the tribe of *bacilli.* In uniting *en bloc* the quantitative results of these preliminary trials, these beings are found in it in enormous proportions; of one hundred schizomycetæ hid in arable soils, one counts with the aid of the Liebig solution, but little favourable for the development of *nematogenes*, ninety bacilli, and at the most a contingent of ten other species of bacteria. At the surface of the *humus*, *micrococci* appear most numerous. Whatever it may result in, it may be already affirmed that the ordinary bacilli play in nature a very important *role* in the phenomena of decomposition of the organic matter into elements assimilable by vegetables."

From these remarks we have an illustration given us of how the bacterial life present in the soil must enter as a most important factor into the question of the causation and spread of Malaria. In Miquel's experiments, we see that he has taken specimens of soil from grass-plots, presumably rich in *humus*, which is the term applied more especially to leaf-mould or other vegetable materials especially abundant in soils of a wet nature, such as marshes, drained or undrained, but which is still present in considerable amounts in all which are fertile. He has found the presence of schizophytes to such a degree as to appear almost incredible; and not only so, but informs us that in the surface soils at any rate, *bacilli* and *micrococci* or those classes amongst which are placed pathogenic bacteria occupy the most prominent place.

(Diagram 72 is inserted in the text to show the relations above indicated.)

By the most superficial examination of the diagram it is obvious that, during the rainy periods, the number of bacteria becomes excessively small, and passes, on the contrary, up to the maxima, during dry periods. The number, notably increased in October and November, 1879, has rapidly fallen in December, after the fall of a layer of snow equal to 34 m.m. of rain. The cold is very severe; the temperature on the 9th December being the lowest during the century, (24°). From the 1st to the 15th of January the fall is still marked; toward this epoch a minimum of five bacteria by cubic metre has been noted at Montsouris; from the 15th to the 31st the bacteria have been more and more numerous.

In February it rains, the bacteria are excessively rare. The month of March is dry, the schizophytes become numerous; the rains of April cause them to disappear; they reappear in May to remain in small numbers until the second half of September.

To recapitulate, this curve of atmospheric bacteria presents, setting aside some secondary deflections of feeble amplitude, a series of very marked oscillations, of which the heights, more and more elevated, have been observed in the dry periods in the end of January, of March, of May, and of September, and the depressions less and less marked, corresponding with the rainy periods of February, April, June, July, August, and the

He repeats again, what has to be so frequently repeated in the discussion of the subject, that "their number in the soil would be dependent upon the season's rain, dryness, &c."

With these various points affirmed as regards the microscopic life of soils, we must proceed to apply them to those soils which we have at present more particularly under review.

In the swamp districts we, of course, have immense deposits of *humus* in every degree of dryness, according to the situation and the season of the year. At times it is the watery, uncultivated marsh with grasses and reeds present; at others it is such areas largely dried at the surfaces, or in dark pools here and there giving off from their surfaces the odours always present in them; while again it is the borders of these drying marshes which, by drainage, are being gradually brought into cultivation, and which have the soil roughly cultivated and thrown up to the air, when organic decomposition rapidly takes place. As has frequently been remarked in such districts and on the prairie when the soil has been exposed to the sun's rays, or again when railway cuttings have been made on a large scale through alluvial soils, malaria has broken out where before it had been mildly present or wholly absent. Such, looked at from a biological stand point, is a strictly natural result. In the first place the grassy condition of the marsh will not allow bacterial organisms to be freely carried along by currents of wind, and in the next place the turf does not admit of that free exposure of soil to the air whose oxygen is largely a condition of rich bacterial life. That friable nature, a condition of which is that the innumerable interspaces of the soil are subjected to frequent interchanges of air, is absent; and that drying out of a soil which takes place so easily and readily when the *humus* is pulverized by cultivation, and a black absorbent surface is heated up to a high point by the summer's sun, are replaced by the grassy vegetation which prevents the raising of the soil to so high a temperature, and the creation of conditions most favourable to the growth of bacteria. Hence we see that that reduction of the soil to the pulverized condition, which Miquel has shown is the condition of ready propagation and dissemination of the germs which are present in it, is prevented.

Such then being the condition of the soil in large portions of the flat townships, along the Welland Canal and its feeder, we are not surprised that malaria should, in those months in which the temperature admits, be very largely present over all that district. But the district to which our enquiry is more especially directed, is for the most part of quite a different nature. The clays, which in the flat district are largely overlaid by humus, have throughout all the valley of the Grand come to the surface, and, with the few exceptions of the drowned lands along the river, form agricultural lands in a high state of cultivation. Assuming that the virgin soil composed of decomposing vegetation was the same here as in other parts of the Province where malaria has not penetrated, and that cultivation of

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first half of September; whence the general law, verified without a break during three years:—*Contrary to what shows itself for the atmospheric spores of moulds, the number of bacteria, few in periods of rain, increases when all humidity has disappeared from the surface of the soil.* Why this is is explained by the habits and mode of growth of bacteria; oftenest they live in moist media and penetrate substances soaked with juices fitted to nourish them; the wind experiencing then a very great difficulty in tearing away from the soil containing them the particles of all species attached by imbibition or retained by the capillary forces, which cause liquids to adhere to soils; bacteria forming part of those corpuscles, remain at this moment forcibly fixed in the place, even when they are developed. Such is the rational interpretation of the phenomenon. If schizophytes had, however, the faculty of raising themselves into the atmosphere with the vapour of water, as several authors have stated, the opposite condition would be true, because every one knows that bacteria can only develop in the soil and in various media with the condition of finding them provided with a sufficient quantity of water. Now, the number of atmospheric microbes being few, when the soil is moist, bacteria do not enjoy the property of rising into the air with the aqueous vapour, which emanates from it.

Let us now analyze more exactly the influence of dryness on the richness of the air in microphytes. In summer, in the period of strong and continued heat, the atmosphere

the land has gone on for a large number of years, it is clear that if those clay soils of the valley of the Grand and the higher grounds back from the river on either side contribute to the continuance and prevalence of malaria, we have present some other factors—those present in sandy soils—which it becomes very necessary for us to enquire into.

Looking upon the difficulty in all its bearings, it appears to me that the ground water is the suspicious something whose action and effects we must examine into. All, at all acquainted with the mode of deposition of our post-glacial sands, clays and gravels, must know that over the level sedimentary rock strata of this district (excepting, possibly, synclinals or anticlinals.) we have the Erie clays deposited in nearly level layers with a few thin layers of gravel running through them. Their surface, however, as remarked by Logan, has been more or less denuded and rendered irregular before the upper Saugeen clays were deposited. Through the upper Saugeen division and into the lower Erie clays the Grand River has cut its channel; but before reaching its present narrow limits it existed as a broad, flowing stream, eroding year after year these clays till it has left a valley of denudation, as already stated, of more than a mile in width. Now, as all know, it is in valleys thus formed, where layers of deposits abruptly terminate on the declivities, that springs gush forth from the hillside, forced by the weight of overlying collections of underground water, such, as we know, too, takes place mostly in those cases where underlying clay deposits prevent ready downward percolation.

Viewing all these facts in their bearing on the present question, it would seem that there is a probability that the soils of the valley are kept, in the manner above stated, in a condition of saturation much above what the ordinary rains falling on them would produce. I have been able to obtain some, though not very much, information on this point. In the Report of the Agricultural Commission we are told that in some of the flat lands, as in Thorold, Wainfleet and Willoughby townships, water can be got by digging from one to one hundred feet, and we are volunteered the information that in one township the water is sulphurous and none good can be obtained at any depth. Regarding the townships along the valley, I find that water can be obtained in North and South Cayuga at from ten to one hundred feet; in Canboro' it can be got at a depth of twenty feet, while by boring wells it can be got at depths not reaching one hundred feet.

Further interesting information concerning the ground water was obtained from Dr. McCallum, of Dunnville. He informed me that various persons had bored for water on both sides of the river, as in Dunn and Moulton. In distances not far separated one would have to go over one hundred feet before water would be obtained in abundance, while others obtained it at less than eighty feet. In Dunn, the flat township lying in the angle between the river and the lake on the south, borings have been sunk, and in several cases the borer (auger) suddenly passed through clay into what seemed almost a hollow

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gets rid, towards the second or third week, of numerous microbes, whose existence it was easy to prove during the first pleasant days; everything considered, the number of germs diminishes and that by the fact of a desiccation which removes from them, with much of their vitality, the faculty of propagating in media wherein they are seeded.

The climate of Paris, so different in this point of view from that of the south of France, does not often permit the observer to be witness of this disappearance of micro-germs through excess of dryness; notwithstanding, in the month of May of 1880, and in the month of July of the year 1881, we have two series of days without rain where the phenomenon which I note is shown with distinctness.

In the first division of the diagram A, (Fig. 73,) one sees the number of microbes starting out very low at the commencement of the month of May, 1880, rising gradually in proportion as the soil dries, at first with slowness (the medium temperature being still below 10°C.), then rapidly, and finally decreasing up to the first day of June. The result shown by diagram B is not less instructive. The rain ceases falling 26th June, 1881; then the following days, the curve of the microbes takes a course rapidly rising, passes by a maximum to the point of turning towards the 2nd of July, then falls the 3rd and 4th. A fall of rain of 3 m.m. on 6th July, hastens the descent of the curve; but this water is soon evaporated, the number of bacteria rises feebly in order to fall anew under the action of a heat increasing without cessation.'

space—doubtless a thin layer of sand and gravel. In this water was obtained. But what is, if true, very strange, is the statement made by some of the farmers that, whenever there is a southwest storm on the lake, during, and after which, the water of the lake causes that of the river to rise several feet, often filling the marshes below Dunnville, the water rises in these bored wells, and becomes milky; and that after the storm subsides the water falls and becomes clear again. The popular idea is, that there is underground communication with the lake.

While we have accounted for the springs, and in the same way, indeed, for the flowing wells along the river valley, and, perhaps, also, for some of those in Canboro, we have a most difficult problem to explain, viz.:—how there can be flowing wells in Dunn, a township flat, and in very few cases rising more than a few feet above the surface of the lake and the river below Dunnville. Without attempting to account for all the phenomena, I think we may fairly conclude that the layers of the corniferous formation, which are seen to crop out along the shore, have an irregular upper surface; and hence, the water flowing along its surface under the overlying clays is collected in some parts into depressions, so that if borings are sunk water will rise from water pressure behind. In the same way we must expect that soils may be kept more or less constantly wet from water rising to the surface from the same cause.

Assuming, then, that in addition to the tendency of these stiff clay soils to prevent rapid downward filtration of water, we have the fact that their subjacent layers are more or less constantly filled with subsoil waters, serving to increase the difficulty of relieving the upper layers of their waters. Thus we have as a resultant condition a very considerable area on either side of the river, with water kept constantly near the surface.

Supposing this to be true, we have the task of trying to determine what is the bearing of the fact on the prevalence of malaria. All soils possess the power of absorbing more or less moisture, and retaining it. Pure clay possesses this in the greatest degree, and silicious soils in the least. As the natural result of this, soils that become saturated the soonest become parched first. There are few, however, which lose all their absorbed water. Church found a calcareous clay loam to contain from 19 to 28 per cent. after several months drought. The question of how much water a soil is capable of containing is quite a different thing from the readiness with which such water is taken up. Thus, of the water falling as rain, from 60 to 90 per cent. will sink into loose sands, while into sandstone rock only about 25 per cent. penetrates. But, as already seen, the amount entering into the soil depends on such other circumstances as the declivity, the amount of evaporation, the rapidity of the fall, and further, the amount already in the soil. Further, the rapidity with which water soaks into soils must vary greatly with their nature. Some are almost impermeable, as hard rock, and the dense clays to a very large

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In the absence of experiments made in the country where drought reigns without any discontinuance during several months, it is assuredly hazardous to express an opinion on the number of schizophytes which are present in the air during very warm periods; nevertheless, the preceding observations would give the idea that this number can there become smaller than in zones more temperate, watered with rains at short intervals.

The force of the wind has not less influence on the number of bacteria collected; its action, slight and but little appreciable when the soil is moist, becomes very marked when the soil is dry and friable; at Montsouris, in periods during which the winds from the east and west sweep with force the pulverized macadam of the boulevard Jourdan, very near to the place where the air is collected, situated at about sixty metres from the public way, all experiment becomes impracticable, the impurity of the atmosphere is such that the least quantity of air suffices to carry the infection (cause of putrefaction) into solutions the least capable of undergoing change; but these are quite rare transitory conditions of the atmosphere of which it is necessary to take but slight notice, from the fear of altering too greatly the normal means furnished by the consecutive (courant) experiments.

The direction of the wind has an influence not less marked on the number of microbes collected at Montsouris. Everything else being equal, the force of the wind being nearly the same, the time of experiments equally distant from a wet period—

extent. Its downward movement in dense rock is slow, said not to be more than three feet every year in limestone.

I have introduced these remarks to show that a subsoil, or ground water, is slowly accumulated, and can be subject to external influences, acting in a comparatively slow manner, depending largely on its depth below the surface. We have already seen that in this district the underground stream is not more than ten feet below the surface, but there are other cases in which it is not more than two or three. As already seen, this depends on the permeability of strata through which it passes, and the ease or difficulty such a stream has of finding an outflow. For instance, along a lake shore the ground water will always be on a level with the lake. As long as such streams have outlets their water must, as other streams, be in constant movement; and it is probably to stagnation of such underground streams that very serious results are due. Such streams move in Munich, according to Pettenköfer, at the rate of fifteen feet daily; but other instances can be cited where more rapid movements have occurred. From all we have seen it follows that its level is constantly changing, being at times only a few inches, at others many feet below the surface of the soil.

In addition to this line of complete saturation where there is nothing but soil and water, we have an upper layer of soil which, though never absolutely free from moisture, yet has its interstices filled with air in proportion as the moisture is much or little. This air can be accurately measured. It has been found that the humidity of the air of the soil is 80·7 at two metres, and 93·8 at four metres. In other words evaporation from the surface affects the moisture in the air below the surface. The volume of air in the soil is considerable, amounting in soft sands to forty or fifty per cent. A friable soil after cultivation may contain as much as from two to ten times its own volume of air. The composition of this ground air varies greatly from that above the soil. It has no sulphuretted hydrogen ordinarily and but little ammonia; but it is very rich in carbonic acid. Thus, according to Fodor, at four metres below the surface the carbonic acid amounted to 107·5 parts per 1,000. We thus see that the air at the lowest depth is irrespirable, having enough carbonic acid to extinguish a light. Dr. Angus Smith notes that this enormous amount of carbonic acid in the soil indicates very intense chemical changes especially at great depths; but it would seem that this need not be the necessary corollary, and that it is simply due to the fact that being heavy it has gradually increased there, and that whatever oxygen might tend to pass downward through diffusion would be exhausted by combination ere reaching that depth.

Regarding the relations of this sub-soil air we must at once see that its amount must be ever changing, not only on account of being displaced by rain from the surface, but also by the rise and fall of the sub-soil water. Ground air must further be set in movement by changes of external temperature, winds, etc.

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the currents which pass over Montsouris, after having traversed Paris during a great length of time, are always very rich in microbes. The following table reproduces, from a statement based on three years' researches, the mean numerical representations resulting from my observations.

(A table showing the influence of the direction of the wind on the number of germs collected at the park of Montsouris is here introduced into the text.)

Fig. 74 shows in a more convenient form the same results.

Here we see the wind from the Seine blowing from the side of Arcueil to where we usually carry on our experiments, driving before it 42 microbes per cubic metre, etc.; that from south-east, from Montrouge and Chatillon, has a considerably greater number of germs than that from the west; traversing Auteuil, Grenelle, Vaugirard, bears a still higher number; then to start out from this point the winds from the north-west, from north and north-west drive before them atmospheres, having traversed Paris in three great diameters, strongly charged with microbes. East winds coming from the side of Ivry and Charenton bear an air as strongly infested with microbes as the air carried by the wind from the north. In a word, atmospheric currents directed towards Montsouris by the wind from the south-east possess a richness in microbes but little inferior to the mean; they have traversed the heights of Gentilly and of Bicêtre.

Having now these data before us, let us see whether they are going to have any bearing on this whole question of bacterial life in the soils in question, and their escape from them. To say that bacteria are present in these Grand River soils, is, in the present stage of this biological problem, simply uttering a commonplace. The question is one of whether their relations as regards sub-soil air and moisture render them peculiarly fitted for bacterial propagation. From the composition of sub-soil air, it would seem that, inasmuch as carbonic acid exists in unduly large amounts in its upper layers, and as organic matter is here more largely present than in its other parts, microphytes are there multiplying abundantly in decomposing vegetable matter. But will not such likewise be the case in sand and dry rich soils? If this question be answered in the affirmative, then immediately we have to face the question,—are not, then, malaria germs likely to be developed abundantly in such, as in more dense and wet soils; and if so, how is it, if the germ theory of Malaria be true, that it does not prevail over such areas? It is not answering this objection to say that it does sometimes prevail in such districts, for in a broad general way such soils are practically free from malaria. Some remarks, however, upon the conditions of the air, not only in the soil, but over it are necessary before the various facts already stated here can appear in their full bearing upon the problem. As is well known, both the temperature, amount of contained moisture and the purity of the atmosphere are in a very marked degree affected by the nature of the soil, its amount of woodland, vegetation, contained moisture, etc.

What some of these effects are, it is necessary now to consider. From what has been mentioned in the preceding sections, it must be plain that the nature of the soil, in so far as its contained moisture is concerned, must produce a marked effect on the moisture of the superincumbent air. How this is, can be easily explained. The soil, receiving the heat from the direct rays of the sun, rises in temperature to a point varying with the intensity of the heat. This amounts to, in some cases, 150°, and I have found that black earth on a summer day, while the surrounding air shows a temperature of 85-90°F., may reach a temperature of 125°F. Buist thinks that if protected from currents of air, the soil would, in some cases, reach a temperature of 212°F. It will at once be comprehended that this heat will, when radiated into the air, increase its temperature to a high degree. This being the case, the capacity for containing moisture becomes increased in proportion to its increase of temperature: while it is found that evaporation increases proportionately more rapidly even than increased temperature. When it is remembered that the air is almost never in a state of complete saturation, but is always varying in humidity, the amount of water vapour received by it at such high temperatures as the above is very difficult to comprehend. This difficulty is, however, increased by the fact of the varying amount of moisture in the soil as well. But there

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Thus the purest air analyzed at the Observatory comes from the south; that most impure, comes from the hills of Belleville and La Villette.

Without drawing from these observations conclusions other than those they can bear out I shall indicate to hygienists this striking example of the contamination of air by the single fact of its passage over a vast aggregation of people.

Assuming the mean rate of the wind to equal about four metres per second, which is nearly in accordance with fact, a mass of air sweeps over Paris from north to south in half an hour, and charges itself during this course with a number of microbes twice equal to the number of those it previously possessed; in a word, its impurity is tripled. Thus infection being constant, it is easy to calculate the number of microbes daily furnished by the city to the winds whose mission it is to purify it.

To keep within the truth, I shall assume that the stratum of air infested measures only twenty metres of height, and Paris to be formed by a square eight kilometres on each side; the number of germs capable of multiplying in a salty broth, which escape from it by day becomes about equal to 40,000 milliards (1,000 millions). In this hypothesis the atmosphere of Paris being constantly charged with 5,000 milliards of germs, it yields at every instant to the currents of depurating air coming from the country the fifth part of the microbes. At the end of twenty-four hours it has yielded to the air from the country what there can be of bacteria in 50 lit. of broth in full put-

are other most important elements which affect the condition of the atmosphere, both as regards temperature and humidity.

In fact these influences are so marked and definite that that they have caused climate to be classed into (*a*) equable, limited, or insular climates; *i. e.*, with slight yearly and diurnal variations; and (*b*) extreme, excessive or continental; *i. e.*, with great variation.

These, as appears in the names, indicate that proximity to water surfaces are prime conditions; while it may be added that height above the sea-level has a most important influence. This latter aids evaporation from the fact of the rarefaction of the air, by the decrease of atmospheric pressure. But besides the nature of the soil, its proximity to water surfaces, its height above sea-level, and its latitude, the covering of the soil has most important influences. In cold climates the sun's rays are obstructed by vegetation, and evaporation from the ground is slow; in hot countries, vegetation shades the ground and makes it cooler. Herbage is always healthy, as remarked by Dr. Parkes, both because it obstructs the sun's rays and because it aids evaporation; but trees have by far the most important influence on the air, of any kind of vegetation. They act in several distinct ways: (1) by keeping the ground cool by directly obstructing the sun's rays; (2) by presenting in their leaves an immense evaporating surface, from which the sap and moisture in their leaves pass off, and thus reduce the temperature of the surrounding air very materially. Thus Pettenköfer has calculated that an oak tree with 751,592 leaves gave off, by evaporation, during the summer months, 212 inches (in depth), while the rain-fall for the same time was only 25.6 inches; or, as Prof. Grey tells us, an ordinary tree gives off $2\frac{1}{2}$ gallons of water per diem. It will be seen from this calculation, that while it prevents the rapid drying out of the surface of the earth, it serves in a very marked degree to prevent a stagnation in the underground water surrounding the roots, and at the same time, by this means, aids in creating a change in the amount and quality of the sub-soil air. But (3) it serves to keep the air moist and cool not only by evaporation, but from the fact that the warming of the sap in the leaves, as well as the loss by evaporation, creates an upward current of sap, which will again serve a useful purpose by descending into the roots, under the chilling influence of the night air, and so warm the soil. But the influence of trees is still more far-reaching. We have seen that the air is cooled by evaporation of the sap, and that the air surrounding the tree is much moister than that over a similar area of ground. This moist air further obstructs the passage of the sun's rays, and so again prevents the earth from becoming heated. Hence from these two facts of trees making the air moister, and preventing high heating of the soil, and, therefore, of the surrounding air, it follows that the point of saturation of the atmosphere resulting in rain, is sooner reached in such cases, at least when the foliage is on the trees; and again, rapid radiation of the earth's daily received heat is prevented, and, therefore,

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refaction; this simple remark will, I trust, suffice to explain the permanence of the infection of the air to those to whom these figures would appear fantastic, and who would demand the origin of these myriads of microbes.

Other causes appear to exercise an appreciable influence on the richness of the air in bacteria. I shall not, however, speak of them, reserving myself to note them when I shall have in my hands an abundance of statistical documents. I shall not the less insist on the most efficacious mode of action of some purifying agent of the atmosphere; the intermittent rains which follow each other before the dessication of the soil, have in this connection an effective action incomparably more powerful than the rain of copious storms, but of short duration, appearing at intervals often separated by several weeks.

In the neighbourhood of large towns, the snow declared by some authors to be *par excellence* the purifier of the atmosphere, does not long clog the progress of cosmic sediments; if it can entangle in its fall the bacteria found in its passage, it is far from fixing them in the soil in great degree; it appears certain to me that a squall of wind capable of sweeping along (drifting) a layer of very cold snow, removes with it a part of the bacteria which it has been able to (*englober*) envelop, and especially those which have come to form above it, with a mass of detritus of all the kingdoms; this yellow-black dust so easy to distinguish on snow from eight to fifteen days old.

a climate more or less insular in character is produced. It is, however, true that an excessive amount of tree area may keep a soil and atmosphere too damp.

It then appears from these various facts, which in untold measure affect the condition of the atmosphere of any region, that influences for good or ill are producing daily effects affecting this matter of the causation of Malaria. We have now considered some of the principal phenomena connected with water, (sub-soil water, &c.), the soil and the air; and upon their varying relations, it is assumed, that the prevalence or non-prevalence of malaria depends.

What are the relations, apparently existing, in that portion of the Grand River valley most affected with malaria? The experience of those physicians living long in the districts is that in summers similar to the past, during which the early summer had much rain, and was succeeded by a cool, and even moist, period, the prevalence of the disease is much less than in those where with a wet season in early summer, the later months are dry and hot. The same may be said, in less degree, of a wet spring, succeeded by dry weather in the early summer months. Now, the facts present, in either of these cases, are apparently the following :—

The soils of the river valley, having always a certain amount of vegetable organic materials present in them, are first saturated with moisture. By this is caused a movement of the water towards the lower levels, at first we must suppose as sub-soil water at, or very near, the surface. Now, according to all experience, either with ordinary cultivated plants or the lower forms of vegetable life, this condition is most unfavourable to their free growth and development. But with drier weather the sub-soil water is lowered, and the interstices of the soil previously occupied with water are occupied with air, the upper looser portion having most, while every inch in depth will have more moisture, and, consequently, less air. Experience further shows that if this moisture is considerable, the higher forms of vegetable life develop but poorly, while the coarse grasses and sub-aquatic plants take their place. But the moist soils are further favourable for the growth of cryptogamic vegetation of every kind. The conditions are much moisture and smaller amounts of air in the soil. But as the drying out of the soil proceeds, with the gradual lowering of the sub-soil water, the area in which sub-soil air is present is increased until we finally get a comparatively dry upper layer of well aerated soil, with layers as we descend, more moist and containing less air. Hence we have as results a soil which has passed through the stages which all experience shows to be most favourable for the development of bacterial life, viz.: sufficient moisture, not abundant but sufficient air, with, of course, sufficient heat being present. Without the air, organic decomposition does not take place in large amount; but yet, as Dr. Angus Smith has remarked, in all probability nitrates yield up, in the presence of heat and moisture, and in great degree the absence

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Of all seasons of the year the autumn has furnished, up to the present, the highest mean of microbes, then comes the summer, then the spring and winter.

Tri-monthly mean of bacteria collected by the cubic metre of air in the park of Montsouris:

——	Autumn.	Winter.	Spring.	Summer.	Mean.
In 1879-80	169	48	97	76	97
In 1880-81	114	50	73	135	93
In 1881-82	79	61	40	66	62
	121	53	70	92	84

of air, their oxygen in the decomposition or putrefaction of organic substances. On the other hand, the facts stated above concerning the vegetable forms which grow in soil with different amounts of moisture, as well as facts which have been noted by various biologists in the development of bacterial forms, and others very recently published in some experiments by Dr. Angus Smith on sewage decomposition, go to show that abundance of air will not only soon exhaust the conditions favourable for the free development of bacterial life, but will actually prevent, at least for a time, organic decomposition.

On this particular point we may glean some information from the discussions on the development of micro-organisms. Thus, as stated by Magnin, Pasteur affirms that there are two classes of these bacterial organisms, the *aerobies*, or those living in contact with air and needing oxygen; and the *anaerobies* which not only have no need of oxygen, but are destroyed by it. Thus in putrefaction, according to Pasteur, there are the forms, *monas crepusculum* and *bacterium termo* which absorb all the oxygen dissolved in the liquid, and then come to the surface where they form a thick veil, after this, other *vibrioniens* appear developed in a liquid almost entirely free from oxygen, by obtaining this gas from the fermentable matters contained in the liquid.

But Pasteur's position has been assailed by many, such as Hoffmann and Toussaint, whose experiments seem to show that bacterial life ceases to develop as soon as oxygen is exhausted or removed. It would seem certain, according to Cohn, that the complete development of bacillus, as seen in the production of spores, is possible only in the presence of air. Regarding the question of the effect of excess of oxygen, let me quote the remarks of Dr. Angus Smith: "The most complete experiments on æration which I was able to perform were done by the apparatus of Dr. Storer and Mr. Cranston. The Messrs. Storer were good enough to put at my service two of their revolving screws, which are used to agitate the water, to draw down air into the centre, and to send it out at the circumference of the vessel. For this purpose they also put up in my laboratory a gas engine to drive these screws. The result of the æration of sewage and of other liquids containing organic matter to a similar extent was that in all cases putrefaction was delayed by æration. The dissolved oxygen also recovers itself in the ærated specimens better than in the non-ærated. This shows that æration not only prevented putrefaction but prevented also the chemical action consequent upon it. It had, in fact, to a large extent, and for a considerable time, rendered the organic matter inert, or nearly so. Nitrates are also formed more readily in the aerated than in the non-aerated specimens."

Bringing these opinions, which are given from various standpoints, to bear on the question before us the following seems to me quite apparent, viz.: that we have four stages in the history of the falling sub-soil water: (1) One, where the small amount of air in the upper soil, through the large amount of water present, prevents, to any great extent, decom-

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Summed up, the air of the park of Montsouris encloses per cubic metre eighty-four bacteria capable of multiplying (rajeunissable) in Liebig's solution; or 588 microbes capable of multiplying in beef broth charged with 10 grammes of salt per litre.

Laboratory experiments tend to prove that moisture is one of the most powerful causes in lessening the number of the aerial germs. Several very illustrious micrographers have affirmed the presence of bacteria in steam emanated from the surface of different infusions. To prove this fact they have placed over a putrefied liquid a glass plate which in a short time was covered with scum, then with fine little drops in which appeared later bacteria, so called, sublimated or volatilized.

I have deemed it my duty to occupy myself with the refutation of this assertion contradicted by the results of the statistics of ærial bacteria; indeed, it became very difficult to explain in this case the scarcity of microbes in time of rain, a period, I repeat, when the bacteria multiply rapidly on the surface of the soil. Moreover, moist heat having been signalized as very favourable for the diffusion of schizophytes, I have been obliged to establish a group of experiments in order to fight against this error which has insensibly crept into micrographical science.

The vapours rising from the most impure waters, and from wet soil are always free from germs. I have not to define what we understand in physics by the phenomenon of spontaneous evaporation. It is, as we know, the slow and tranquil passage in the state

position of organic matter and hence, proportionately, the growth of plants of any kind. This prevention of growth is, doubtless, aided from the fact that the evaporation from the surface of the soil keeps it at too low a temperature for the development of bacterial life, since Cohn has shown that at and below 32° F. bacteria cease to develop, and that temperatures from 77° to 104° F. are the most favourable for them. (2) The second stage is that in which air and moisture are both present in the soil in moderate amounts, and in which with a warm temperature, decomposition of organic matter goes on rapidly, and bacteria under various forms, as micrococci and bacilli (according to Miquel) are present in large amounts. (3) There is the stage when the upper soils are dried out on the surface. (4) We have a final stage of drying out when the upper soil may contain, as remarked by Parkes, from two to ten times its own volume of air, and be parched, and contain almost no moisture. It will then be evident that while no one of these ever wholly exists over an extended area, yet, there still are times when some one of them is the prevailing condition; and, moreover, for reasons already indicated, such must have very definite influences on the amount of bacterial life present in the soil. Now, taking these conditions in order it may be affirmed with much certainty, that malaria cannot exist largely when the soil presents the conditions in the fourth stage; but this is rare. The second stage is one in which it may be said that bacterial life develops with greatest readiness, and during which it may be affirmed that *bacillus malariæ* is abundantly produced.

It would seem, however, that if Miquel's experiments prove that there is a general law regulating the distribution of germs in the air, depending first upon a period of moisture followed by a period of drying out, then it must appear that not only will the conditions present in the second stage be necessary, but also that stage three must be reached before the germs existing in the soil are capable of free distribution in the air. How, apparently, the conditions present in stage two may produce malaria through drinking water will be again referred to.

Regarding stage four, both experiment and analogy lead us to infer, that as the conditions which create the disease, seen in stage three, develop into stage four, the development of germs is in large degree retarded. For the full explanation of this, reference can be made to the subjoined printed extracts from Miquel.

Another point already hinted at in its bearing on the question, must be referred to here. It has been already stated that the sun's rays increase the soil temperature many degrees above that of the air above it during the day. This super-heated layer of soil will not be thick; but the fact in this connection must be noted, that it increases throughout the summer. In temperate climates the heat passes in summer some four feet into the soil during the day, and recedes at night. In all probability the transmission of heat is due principally to air currents, since it must be perfectly plain, that the heated air of the soil

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of vapour of a liquid exposed to the contact of the atmosphere. The layers of air nearest to the surface of the liquid or of the substance soaked with water, charge themselves with moisture, are replaced by a drier layer which in turn saturates itself, etc. The aqueous element ends by disappearing. Every other phenomenon, such as the pulverization of water, which often shows itself in the time of violent winds, ought not to be confounded with simple evaporation. Pulverization is a raising of liquid particles perfectly similar to the raising of dry dust. The phenomena of infection which result from it are identically the same; the aqueous globules launched into the atmosphere diminish rapidly in volume, evaporate and soon leave dry bacteria and corpuscles of every kind with which they are charged. In order to demonstrate the exactness of this phenomenon I have had constructed the system of double bulb flasks shown in Fig. 75. It is a tube with a bulb A on the branch of which a second tube B with a bulb is joined; the apparatus empty of liquid furnished with a wad in (d) and in (f), is heated to 200°C. during four hours; then the point (p) being broken off and plunged into a sterilized nutrient liquid we charge each bulb with nearly 20 c.c. of liquid by double siphonage easy to understand but rather delicate to practise. One then passes a sterilized wad into P. The apparatus thus modified has the appearance, as is shown in Fig 75, minus the filed-off point. We then place it in the stove during a month, and if the liquids preserve

will rise rapidly out of it, in proportion as it is heated, above the temperature of the surrounding air. Some remarkable experiments have recently been made public by Prof. Tyndall, which prove in the clearest manner, that in addition to the facts above stated and which are well-known, the declining sun gives an opportunity for a completely different set of phenomena to take place. Speaking of the radiation of heat, he remarks, that the earth, as compared with space, is a comparatively hot body, and that were it not for the apparently trivial amount of invisible vapour in the air, the earth would soon be reduced to the frigidity of death.

Arranging at an exposed place on Hind's Head for some experiments, he placed one thermometer on a horizontal cord four feet from the ground, and another one on non-conducting cotton-wool on the ground immediately under the first. He made observations on various evenings, and selected for the first the 16th of January. It was a day of extraordinary calmness and serenity. Its visible condition was that usually considered most favourable for rapid radiation of heat, and therefore best calculated to show a large difference between the thermometers by which observations were made as follows:

1st. At 5 p.m., when the ground thermometer was 5°F. higher than that in air.

2nd. At 6 p.m., when both were nearly equal.

3rd. At 8 and 8:30 p.m.. when the ground thermometer was 5°F. lower.

Apparently there was nothing in the air to show why there should be any difference between them. Such anomalies had never been explained until it was shown that the intrusion of a perfectly invisible vapour was competent to check radiation, while its passing away again opened a door into space.

Another observation was made January 30th, on a very calm night. At 7.15 p.m., the ground thermometer was 6°F. lower than the other; but at 9.30 p.m., the ground thermometer was only 4°F. lower. In both these instances, the air reaching Hind's Head had swept over the Atlantic, and had charged itself with vapour, according to its temperature. Other observations, as that on December 10th, were made when the wind blew from the north-east, that is, over the land. The temperature was very low, and hence, calculated to lessen the amount of atmospheric vapour. Snow was a foot deep.

At 8 a.m., both thermometers were quickly put in position, both having a temperature of 35°F. A single minute's exposure showed a difference of 5°; five minutes showed a difference of 13°; and after ten minutes the difference was 17°. During these observations a dense bank of cloud retarded the rising of the sun. It had cleared the bank during the two last observations, and touching the air thermometer raised the temperature from 26° to 29°. The very great difference shown above is greatly due to this.

Again, 31st March, though the temperature was far below dew point, there was very little dew. It was obviously a dry air. At 10 p.m., the temperature of the air thermometer was 37°, that of the wool being 20°, or a difference of 17°. These

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perfect limpidity we make the following experiment. The contents of the bulb A is sown with any bacteria cultivated in a state of purity; it is not slow in becoming turbid and presents signs of evident change; the liquid in the bulb B, even after remaining a month in the stove still shows itself absolutely clear. We then cause a rapid current of air to pass through the apparatus (2-3 litres in 10 minutes); the air is filtered on entering by the wad (b), passes bubbling into the altered liquid, penetrates through the swan necked tube and bubbles a second time through the clear infusion, the branch being closed. We place, a third time, the apparatus in the stove, the contents of the bulb B. intact before the passage of the current of air become turbid and filled with the species of bacterium sown in the first bulb. The bacterium is assuredly borne in this case through a bent tube, and I shall add, *en passant*, that this transport, more difficult to realize with subterranean microbes, productive of dense deposits, is effected with the greatest facility, with those common bacteria which form at the surface of infusions light pellicles which climb the wall of the vase with the fluid drawn up by capillarity. This infection transmitted to a distance is evidently due to germs or to adult bacteria removed by the gaseous bubbles which come to burst at the surface of the altered liquid and which bear with them the cloud formed by the rupture of the covering which forms their envelope.

experiments not only point to the fact that radiation produces most rapid cooling of the earth, but also that in the same degree the air in the soil, as well as over it, must greatly contract with the sudden fall of temperature. Hence we may say, that not only does soil air largely pass out of the soil during the day, but also that a considerable amount of fresh air returns to the soil at night. In other words, ground air bearing the gases of decomposition, and possibly invisible organisms, passes up into the outer atmosphere every warm day, and has its place largely taken by fresh external air with abundance of oxygen for continuing decomposition in the soil and the development of bacterial life.

Of necessity the deeper that air is in the soil the less will it be subject to change of temperature, and hence have its constituents change less, and will, therefore, always contain more carbonic acid and less oxygen ; and thus the supposition, that because the deeper air contains, on experiment, more carbonic acid, that therefore putrefaction and bacterial life are more intense, is wholly incorrect. But while we have thus explained how oxygen, in sufficient amounts for the development of bacterial life in the soil, is supplied, we have, in large measure, disposed of the theory which affirms that stagnant ground water is the chief factor in malaria. That stagnant ground water near the surface, is coincident with malarial diseases, does not prove that these stand in causal relation to each other, as Col. Waring and other sanitarians have suggested ; but all that can be fairly inferred from the two facts is, that water is always so near the surface that the upper germ-producing layer is, by capillary attraction, always sufficiently supplied with water to favour the development of such forms.

The point of how very free æration of the soil, temporarily producing excessive amounts of malaria, as when new soil is exposed to the air, as by draining, tends to lessen greatly the malaria of a district can be readily explained by the various facts already stated.

But we notice a hitherto unnoticed point, and one which seems to me to throw much light on the fact stated everywhere by writers, that exposure to night-air is far more dangerous, in inducing Malaria, than during the day-time. In fact it is generally stated that the malaria miasm is inert during the day. It has been shown how the highly heated soil during the day warms the air nearest it by radiation, and how there is, in consequence, an ascending current of air, rapid in proportion to the difference in temperature, between soil and air. Now, assuming that the dried surface of the ground, whence the particles of dust including microscopic animal and vegetable forms are being carried into the air by the wind, yields its dust much more readily during the day, it will be seen that were there no other factor entering in, the day-air ought to be more malarial than the night-air. But it is not, and apparently for the following reason :—Supposing that a given number of disease germs are given off during a minute from the soil, they do not remain in the lower strata of air where they would be likely to affect persons, but are carried upwards at a rate hardly thought possible. By experiment with an anemometer, I have found that air passes from a room at 60° F. into the outer air at 32° F. by a chimney, at the rate of nearly 100 feet per minute. It must thus appear clear, that since the ground is swept constantly during the day by winds of more or less violence, that soon the loose particles of dust will be set in motion, and will have an upward tendency, rapid in proportion to the height of the ground temperature. The rapid disappearance of the mists along a valley at sunrise—explained by Tyndall's experiment at sunrise,—and the height to which on a warm summer day masses of vapour, in the shape of cumulus cloud, rise, give us adequate conceptions of these upward currents of heated air. Other accidental proofs show these facts in the most unexpected manner. It has been frequently noticed that on calm summer days the atmosphere in the neigbourhood of establishments creating effluvium nuisances, is practically free from the disagreeable smells ascending from boiling vats of decomposing animal matter ; but when the sun has set, these odours will be most offensive at distances as much as even one to two miles from the manufactory. Again it has been found that the vegetation near acid manufactories is much less injuriously affected than that at considerable distances away ; and that the injury is especially great on the slopes of rising ground. The upward currents of air produced by the furnaces, are the simple explanation of the first, while the cooling of these vapours in the upper air and their gradual descent toward sundown, explain the second phenomena. Now, if we apply the same reasoning, we will understand how, with radiation, the ground becomes very rapidly cooled with the descend-

ing sun, and that, instead of there being currents upward from the earth, colder upper currents will be descending to the earth and will bear with them, as it were, the accumulated dust which has been borne upward during the day, and which, on calm nights especially, will likewise tend to descend by gravity.

That this is a factor seems true, when it is known that calm nights are more dangerous to health than those with wind (unless under certain special circumstanaes). Another fact is that of the greater dangers temporary damp produces. Damp air, as is well known, and as seen also in Tyndall's experiments, prevents, in large degree, rapid radiation; hence there will tend to collect near the earth the dust of the air in the same way as at night, the tendency being increased by the lightness of damp air and the therefore comparatively heavier dust. There is also in this connection the interesting question of the attraction existing between particles of vapour and of dust. It will thus be seen that this factor of damp is difficult to fully calculate in its effects, since on the one hand it prevents the rapid upward currents during the day, and, hence, tends to keep ground air near the ground; and on the other, while it prevents the rapid cooling of the earth and so militates against the upper currents of air being brought down toward the cold earth, it has, as seen above, acted during the day in large degree in preventing upward currents which may contain germs. However, what we see here is that which occurs at the beginning of a wet period, since Miquel's experiments in every respect go to show that the number of germs in the air, and similarly zymotic diseases, lessen in lengthened wet periods.

We now pass on to the consideration of how the existence of some of those considerations which it would seem are most favourable for the development of bacteria, are enabled to produce their wide-spread effects. In this connection, as on some of the other points, the conclusions are those drawn mostly from inference and analogy.

In the first place we have a question, which, as already mentioned, has been a source of much speculation and enquiry in some of the eastern States, viz., how is it that not only do the old malaria lands, similar in many ways to the valley of the Grand, retain much of their malaria, but that the disease seems steadily to be extending in certain directions over wide areas of country previously free from it? There seem to me to be several of the preceding statements, which have a very direct bearing on the subject. There can be no doubt but that the whole upland surface of the country, and many of the swampy districts are during the warm season, say from May to October, drier than they formerly were when the country was well wooded. It must be remembered, however, that throughout this period the rainfall has not become so much less in amount as irregular in its distribution. The reason of this dryness is two-fold. First, the rains that fall do not sink into the ground nearly so thoroughly as in the time when larger areas were covered with forest. As stated by Professor George Rolleston, in a paper in the Journal of the Royal Geographical Society, for 1879, entitled, "Modification of external aspects of Organic Nature, produced by Man's interference," there can be no doubt as to another mechanical effect of trees, in the way of breaking both the force and fall of raindrops, and thereby preventing *pro tanto*, the over-rapid flowing away of such rain and over-violent washing away of the soil. (See London and Grand River floods.) This simple fact is one of the greatest importance, since finely divided rain reaches the roots and spongioles, while large drops roll away. The second reason is that the ground, in this way deprived of the forest, becomes during the warm summer weather heated much more rapidly and excessively than it otherwise would. While thus preventing saturation of the surrounding atmosphere, and hence rainfall, it becomes for the same reason a very rapid radiator of heat, with attendant results such as we have seen above.

But it must be evident that with regard to the spread of malaria these effects of deforesting play an important part. In the first place the presence of trees has in all ages and times been one of the most powerful agents in mechanially preventing the lateral spread of malaria. As Rolleston puts it: "The loss of the square surface represented by a tree in full leaf, means the loss of a very considerable area upon which any particulate matter can be caught and filtered out of the atmosphere. The more sticky the leaves, of course the more perfect the interception; and as modern investigations,

such as those which Mr. John Simon, C. B., of the Local Government Board, have taught that the germs of many of the most infectious diseases are partiulate, we can understand how it is that from many quarters of the world we have more or less well-established histories of belts, or curtains of trees protecting towns from malarious and anti-sanitary influences.

But, apart from the greatly beneficial mechanical action of trees, we have, in the second place, facts which show that they tend to give regularity to the distribution of rainfall, and thus prevent the extreme drying out of the soil. They have in all times been further remarked to greatly break the violence of winds. Now, applying these two well known facts, we see that the first, by keeping the ground from drying out, prevents the particulate germs from being as rapidly carried into the air; and further, even if they are carried into the air, the second fact operates by preventing them from being borne long distances by strong winds. That such dust particles are borne long distances, the history of cholera and plague crossing wide desert expanses in the direction of prevailing winds, has long since been noticed, as stated by Edwin Chadwick, C.B.; while to this we may add, that if the theory propounded by Norman Lockyer be true concerning the cause of the recent glow at, and after, sunset in the western heavens, being due to the incandescent matter from Javan, and other volcanic eruptions, we must suppose that the upper currents of the air carry particulate germs to distances much greater than has hitherto been thought probable. If, then, these established facts regarding the effects of deforesting be regarded in their bearing on the question of not only the comparatively local effects in the causation of malaria, but also in explaining how they may be produced at greater distances, we would seem to have a rational basis of explanation of the facts noticed in Canada, as in the United States, that malarial diseases not only persist in very considerable amounts in their old haunts, but are steadily extending their area of distribution up river valleys, and much more widely over the general surface of the country.*

It would seem then, from the theory of the bacterial origin of malaria, that it is only necessary to assume that with certain *foci*, as in the drowned lands and alluvial flats of the Grand River, or other stream, the germs of the disease are carried by the winds a short distance up the streams, or in other directions, from their *nidus*, till they are deposited on some other soil congenial to them. Here they develop, and another *focus* is established. The disease will appear among the surrounding inhabitants in some of its protean forms, according to circumstances. It may rest for a year, or several, until a season very favourable to it is present, when it makes another advance. This process is so well illustrated by what every agriculturist now unfortunately knows, in the case of the fungus known as *sphoeria morbus*, or black knot, which, within a few years, has destroyed thousands upon thousands of plum and cherry trees, that it cannot be difficult to understand how the same laws of development and causes of distribution are at work in the spread of malaria.

For instance, in the Madoc malaria investigation, a report of which is found in the First Annual Report of the Board, it is stated that "The *Malaria area*, extending itself some two miles in breadth along either side of the river (Moira), is confined to the neighbourhood, except at Peterson's saw mill, some five miles away, where a few cases were known some twelve or fifteen years ago; while at Marmora, up the river in a north and west direction, with high, dry river-banks, malaria appeared some years later than at Madoc, and again at Doloro it has this year been as bad as last."

This simple explanation of its spread, sometimes, and in very favourable seasons, by great strides, in other cases, step by step, seems, on the whole, to be explained by the extensive, collected and summarized reports of the secretary of the Rhode Island State Board of Health in which, on a broad scale, while following in its more local manifestations the course of streams, it has spread in the direction of the prevailing winds.

But as in every study of this kind, it is the ultimate effects on the individual that we have especially to consider, it would be leaving out a most important part of the discussion, were we not to ask whether there are not certain physical conditions of the

* Dr. Snow, of Rhode Island, states:—"It has been gradually travelling from the vicinity of New York city, up the rivers and valleys of New England, during the last ten or fifteen years."

human constitution making it more or less susceptible to the injurious effects of malaria? It needs but little experience to learn that in this as in many other diseases, the bodily state is a most important factor in the final effects of exposure to any *causa morbi.* In fact, it may be asserted as a rule, that those physically strong are comparatively seldom affected with malaria, as compared with the less robust. In a general way this is explained by saying, that nature's power of resistance to all pernicious influences is greater in the strong; or, expressed in Jæger's language, there are less fluids and more proportionately of solids in any given volume of body tissue. However this may be, we know that there are certainly conditions of the body when persons are affected most readily by all external influences. Especially is this seen in the influence of heat and cold on the body. So great is the latter influence as a factor in the causation of disease, that we have every now and then some theorist asserting that all disease is but the influence of cold on the body—as a week or so ago was asserted by an American writer, even of Diphtheria.

In the matter of Malaria, medical authorities of high repute have asserted that it is wholly due to the influence of cold—so great, indeed, is the determining influence of cold on the powers of resistance to the disease. As great an authority, indeed, as Surgeon Major Oldham, of the Indian Medical Service, with a most extended experience of the disease in all its forms in that country, has arrived at this conclusion in his work, "What is Malaria? and why is it most intense in hot climates," 1871. Logan in a work on Chili, speaks of it as occurring on the high mountains of that country, while the low grounds are free from it. Oldham tells us that the dwellers in the Terai, at the foot of the Himalayas, are miserable, listless *cretins*, from the effects of the disease on generation after generation; while the Jervas of the Punjaub, employed in fishing and catching wild fowl, spend whole nights in their boats under the reeds of the marshes unharmed in the midst of Malaria; but they are wrapped in a peculiar costume from head to foot and keep up a smouldering fire. But to go no further with the authorities, let us endeavour to find out, if possible, what the effects of the cold are.

"In all localities and at all seasons, it is at or after sunset that the malarial influence prevails, and it tells most when a cold night follows a hot day. Perhaps its most constant fact is, that it goes with watery exhalations and with the fall of dew. On wet soils and over swamps and marshes, the aqueous vapour condenses as the air cools; while on dry surfaces rapid radiation furnishes heavy dew-falls. The 'hill fever' of Mysore occurs amongst bare rocks and stones, and brown earth at hottest seasons, where the diurnal range in the shade being 20°-30°, that of the rocks in the sun may show a surface temperature of up to 212°." Such is the substance of an extract from an article on Malaria in the recent edition of the Encyclopedia Britannica. Cold, then, seems here on superficial examination, to be the cause of Malaria. But a clear distinction ought to be made between the cause and the conditions under which it operates.

In an unfinished article, which I have been enabled to peruse through the kindness of Dr. Charles Smart, Captain and Assistant Surgeon U. S. A., on medical climatology prepared by him when stationed at Fort Bridger, is given the result of an extended series of experiments and observations on certain obscure and difficult problems, the bearing of which on health is, it seems to me, of a wholly phenomenal importance.

He states that "it will readily be allowed that what the profession requires is not a record of the dead or absolute temperature, such as that given by an ordinary thermometer; but a measure of the rapidity with which a certain climatic exposure carries off the animal heat. Of course," he says, "it is well recognized that the wind exercises an important part in giving character to a climate; but I am not aware that any attempt has been made to give a definite expression to its influence. The degree of humidity is also most important. There are three principal factors which make up the sum of what we call climate, in its relation, at least, to our animal heat, viz:—(1) The absolute temperature of the air; (2) its motion; and (3) the moisture contained in it.

It must appear that we have already set forth the problem of how these physical forces, which we are accustomed to look upon as those which are the daily study of meteorologists and physicists, are to be calculated in their effects on the human system—which effects it is assumed by a large school of etiologists, are so great as to produce a

"profound disorganization of the nervous mechanism that presides over the temperature of the body; and that this upsetting of the heat-regulating centre is likely to happen when the body has been exposed during the day to extreme solar heat and fatigue, and exposed at sundown and in the night to the tropical or sub-tropical chill which will be severe in proportion to the rapid cooling of the ground, and the amount of vapour condensed in the lowest stratum of the air."

To the end of endeavouring to exactly estimate these various factors Dr. Smart has arranged an instrument based on the idea, that when the mercury of the thermometer is raised by heat to a given point, the rapidity with which it will fall from that point in a given time, under exposure to the influence of certain climatic factors may give the means of expressing the relative value of such climatic influences.

Thus taking 98·4°F. as the normal body temperature, all observations on the fall of the thermometer should be made from that level to the dead or absolute temperature of surrounding conditions. It was conceived the same thermometer would always fall from 98·4° to the same point when exposed in the calm for the same length of time to the same given temperature. This was in practice found to be the case. Suppose the distance D from 98·4°to the given temperature to be expressed as unity, then the fall in the calm for a given temperature below 98.4° will be a certain fractional part of that unity—say for example—·200 parts.

If now the thermometer, which falls when exposed to a given temperature, ·200 of the distance from 98·4° to that temperature, be exposed for the given length of time, plus *wind* and *moisture*, and it is found that instead of falling ·200 of D it falls ·500, we are warranted in saying that of this fall, all that is in excess of ·200, or the fall in the calm is due to the *moisture* and *wind.* It may be assumed then that a thermometer might be arranged to register the difference of temperatures in the calm, and that variations from this in any given time would be equivalent to the wind and moisture. So many difficulties arose here, however, that it was deemed better to have reference tables. A calm day and close room were selected, and the apparatus of thermometers for observations arranged. Observations were made with four thermometers, and for varying lengths of time, as 1, 1½, 2, 3, and 4 minutes, and the results agreed with each other. But it was found that although the same thermometer always fell the same distance, when exposed for the same time to the same temperature, it did not fall the same fractional part of the distance for all temperatures, but increased in its fall as the distance to be fallen, or the difference in temperature increased—*i. e.*—if the fall ·200 of D when the given temperature was 40°, it fell less than ·200 when the given temperature was higher than 40°F., and more when below 40°F., this increase depending no doubt upon the convection or displacement current, estimated by an increase in the difference of temperature between the heated bulb and the surrounding air.

Thus, with one thermometer, it was found that with one minute's exposure to :—

88.4° making a D of	10	the fall was	.180 of D.	48.4° making a D of	50	the fall was	.220 of D.
78·4 "	20	"	.200 "	38.4 "	60	"	.230 "
68.4 "	30	"	.207 "	28.4 "	70	"	.235 "
58.4 "	40	"	.215 "	18.4 "	80	"	.240 "

As it was found impossible to determine by experiment the fall for every degree of calm, and yet, as a close approximation to many degrees below zero was necessary, these observations were made the basis of a calculation by which a scale for every day was made.

The laws governing the motion of currents established by differences of temperature were considered in this calculation. That its results approach to fact is shown by the close approximation of the calculated to the observed figures which resulted as follows:—
Thus—

D of 10°	the calculated fall is .186	the observed	.186	D of 50°	the calculated fall is .222	the observed	.220
" 20	" .198	"	.200	" 60	" .228	"	.230
" 30	" .207	"	.207	" 70	" ·234	"	.235
" 40	" .214	"	.215	" 80	" .240	"	.240

We thus have a thermometer.

Now, it was necessary to make experiments to show the fall under the influence of

wind and moisture as well. Casellar's (No. 350) Air Meter was placed immediately under the special third thermometer.

The experiments made in the calm with a series of 500 observations, conducted during exposure of the bulb, heated in the mouth, led the observer to anticipate that his observations would not only serve to determine the increased cooling influence proportioned to a given increase in the velocity of the air, but would, if continued long enough, furnish data for differentiating between the cooling influence of the wind and that of moisture, with which the air might be laden. The barometric readings for Fort Bridger were generally above 25.52 inches. A thousand observations were made, from which conclusions were figured. These tables are made to give expression to the influence of the moisture in the air.

Ratio borne by the *fall when exposed* to the *fall in the calm*, the latter being unity. Calm = 1.

$\frac{1}{4}$ m. per hour	= 1.42		$5\frac{1}{2}$ m. per hour	= 2.75
$\frac{1}{2}$ "	= 1.54		6 "	= 2.81
$\frac{3}{4}$ "	= 1.66		7 "	= 2.93
1 "	= 1.71		8 "	= 3.01
$1\frac{1}{2}$ "	= 1.88		9 "	= 3.08
2 "	= 2.03		10 "	= 3.18
$2\frac{1}{2}$ "	= 2.14		12 "	= 3.27
3 "	= 2.21		14 "	= 3.39
$3\frac{1}{2}$ "	= 2.39		16 "	= 3.47
4 "	= 2.43		18 "	= 3.53
$4\frac{1}{2}$ "	= 2.54		20 "	= 3.60
5 "	= 2.63			

In summing up the results, the absolute accuracy expected was absent, but its cause was soon discovered to be due to the wind not being always blowing from the same quarter, and hence varying in its effects on the metre. Hence it is evident that, with the errors uncorrected, the calculation for moisture cannot be given. Supposing this error to be slight, the following example of the rise of the table may be given:—

Suppose the absolute temperature 68.4°, a distance to be fallen of 30°—and wind at eight miles, its ratio being 3.01—*i. e.*, that many times faster than in calm. But for 30° in the calm, it falls .207 of 30°, for the wind exposure it therefore falls 6.23 of 30°, or from 98.4 to 79.7° F. But as 79.7° of the absolute scale is equal to 20° F. of the sensitive scale, we are warranted in saying that a temperature of 68.4°, with eight miles per hour of wind, is equal in its cooling effect to a temperature of 20° F. in the calm. And so on for all the other temperatures and velocities of the air. Thus is the calculated equivalent in calm cold for every temperature down to – 20°, when combined with wind, from calm up to 20 miles.

I have given these extracts and examples from Dr. Smart's paper because I believe that, in the application of the facts, more or less previously apprehended, which have been placed upon a firm basis by Dr. Smart, we have the explanation of the many more or less obscure and mysterious effects which have been attributed to cold.

Thus we can understand how Dr. Oldham, noticing the fact of the great prevalence of Malaria amongst the dwellers in the Terai at the foot of the Himalayas, a region where, though hot during the day, the winds cooled by the mountain side, descend rapidly upon the unfortunate inhabitants of the lowlands at night, should have attributed the prevalence of Malaria to the rapid abstraction of body heat, or, in other words, to the influence of cold on the nerve centres. But it will readily be seen that, while this cause ought to produce Pneumonia and Nephritis in, at least, as great a degree as Malaria—thus complicating his theory of causation—the atmospheric phenomena which take place are equally in keeping with the bacterial origin of Malaria; since the descending currents of air are just those which, during the heat of the day, have rapidly ascended, bearing with them organic and inorganic particles, and which, cooled in the upper air, by contact with the mountain side, bear with them at night-fall the "dust of disease," and especially of Malaria. So that while it cannot be doubted but that the extremes of temperature to which the human body is subjected in such cases exert a most deleterious influence on its health and capacity for the resistance of disease, we believe, that, contrary to Dr. Oldham's opinion, cold is not the cause, but an adjunctive

influence preventing the body from throwing off the received malarial virus. May it not be possible that the congestion of the internal organs of the body, by the rapid abstraction of animal heat, becomes the occasion by which *bacillus malariæ* obtains its lodgment and opportunity for development, for it must be remembered that the depressing influences of such degrees of cold are by no means temporary?

After this extended recital of the many elements which enter into the solution of malaria, it becomes a necessary duty to enquire into the means which these scientific data point to as best serving to lessen and finally remove the evil. It would seem, bringing, as it were, these many rays of light to a focus, that the whole question resolves itself into one of bringing fresh air into the soil in abundance, and replanting some of our deforested areas in such manner as foreign experience has taught us is best.

The first of these may be called the principal condition of preventing malaria, and the second its adjunct. How the first is to be attained is, with variations of detail according to circumstances, a well understood matter. It is one of drainage, carried out on the principles which experience has shown are most productive of good results in matters pertaining to agriculture, as regards the influence of drainage in preventing malaria. While experience has taught that improved drainage tends to directly lessen the prevalence of malaria, the manner in which this action takes place is one of some difficulty as regards explanation. Some of the effects of drainage may be briefly summed up:

1. Drainage increases the temperature of soils as has been proved by Parkes, who found that the mean average temperature of thirty-seven experiments, gave, at seven inches below the surface, an increase of 10°F. in a drained and cultivated soil over that at the same depth in an adjacent bog. Some of the reasons why a wet land remains cold are, (*a*) evaporation from it produces cold; (*b*) water has a high radiating power; (*c*) water has a high specific heat; (*d*) the conduction of heat downwards in a wet soil takes place very slowly.

2. The opposite of this condition exists in drained soil, since, as we have seen, there is a free circulation of air in it, which air partakes of the temperature of the adjacent atmosphere.

3. As a direct result of drainage the lower forms of vegetable life, as some grasses and subaquatic plants, are readily replaced by higher forms.

4. Analogy would lead us to suppose, that, as dry soils are less favourable to equisetæ and mosses, so they would likewise be less favourable to still more lowly, organized forms, as fungi and bacteria.

Inasmuch, however, as the bearings of these effects on the development and dissemination of bacteria in air have been dealt with, it is unnecessary to show further how thorough drainage promotes the restriction of malaria.

The matter of reforesting denuded areas of land in the Province being one, the benefits of which, as regards agriculture, have been set forth recently with much prominence in the Forestry Report, need not here be entered into. There is one point, mentioned in a previous page of this report, which again must be referred to. It was stated that apparently well-water became a vehicle for the propagation of malaria. Assuming that the development of *bacillus malariæ* goes on in the upper soils, it does not need argument, in the light of the facts set forth by Pettenkofer, in order to show that drainage from subsoils may contaminate well-water with the malaria virus in the same way as it has time and again been shown to be contaminated by sewage. The prevalence of malaria throughout the extreme winter weather of January and February, in Ontario, gives apparent proof to this supposition, and points to the same measures regarding its prevention from this cause as those which prevent sewage contamination.

The discussion of the many factors which enter into the malaria problem has been undertaken here with the hope that the relations which they bear to its solution may be seen, and that the many partial explanations which from time to time have been given concerning its so mysterious phenomena, may be brought to bear on the question of its restriction and final extermination, by their being understood to be but parts of a grand whole, in the explanation of the potent influences which low forms of life have upon the higher forms, and of how the physical forces at work in earth and water silently

produce effects upon man greater even than those of the terror-striking earthquake or the desolating tidal wave, which at times has caused wide-spread death to unsuspecting mortals.

Experiments made concerning Organisms in Air, collected near the Dunnville Marshes.

When I undertook the investigation upon which this report is based, it occurred to me that I might add to its interest by making some collections of air in a neighbourhood well known to be malarious, and examining the nature of the micro-organisms which it might contain. As already stated, however, the time, materials, and experience in this field at my disposal were too limited to make this in any degree thorough. But nevertheless it has been the beginning of a study which may, apparently at some future time, prove valuable.

There were two questions which it occurred to me would be of interest to investigate in this connection, viz :—first, what the number of organisms in this air might be at different hours during the day, and with the wind from opposite quarters; and second, what the characters of these might be? The first of these was undertaken largely upon the plan laid down by M. Miquel, and the second was based upon experiments published by Dr. Angus Smith, in his application of Koch's gelatine process to the determination of the quality of water.

In regard to both, the first requisite was the preparation of special apparatus for making collections of air. This was a matter of much difficulty, owing to the fact that the Board had no laboratory apparatus at its command. I obtained, however, most of the requisites through the kindness of my friends, the Professors and Assistants of the University and School of Practical Science. Amongst these I make special mention of Prof. R. R. Wright, for suggestions regarding the biological work; to Prof. Pike and Dr. W. H. Ellis for the use of chemical apparatus; and, finally, I thank Mr. F. Babington, Dr. Ellis's Assistant, for the extended help he gave me in preparing chemical apparatus, and making suggestions, without which my experiments would have been impossible.

After considering various methods, the one apparently at once the most efficient and attainable was the following :—An ordinary laboratory aspirator, capable of holding about ten litres of water, was connected by rubber tubing with a washing-bottle furnished with a rubber cork and two glass tubes. This was next connected with a glass tube passed through a rubber cork, which fitted a U tube, capable of holding 50 c.c. Retort stands and other conveniences were also provided. This apparatus was used in the following manner : (Through the kindness of Dr. G. A. McCallum, of Dunnville, I succeeded in obtaining a convenient spot for operations on a strip of land about a quarter of a mile in width, lying between the Grand River and its feeder to the Welland Canal. The place is about a mile below Dunnville on the east bank of the river, opposite to the broad marshes of the west bank which extend upward to the town, and widening continue downward along the river for five miles to its mouth. While the spot seemed for the purpose to want nothing as regards its malarial properties, it made operations easy by enabling me to obtain, close by, an unlimited supply of water.) The aspirator having been filled with a known volume of water, the tubing was attached to it. The other apparatus having been also set in readiness the stop-cock at the bottom of the aspirator was opened. The rapidity of flow from this was regulated both by the stop-cock and a long rubber tube attached to it. As rapidly as the water of the aspirator escaped, air took its place by being drawn first through the U tube and then through the water of the washing-bottle. The length of time of each aspiration is seen in the subsequently appended tables.

The object of this procedure was as follows : Assuming that the air contained both organic and inorganic particles, it was possible by this method to collect them by drawing them through 25 c.c. of distilled water (which had been distilled in Dr. Ellis's laboratory) placed in the U tube. Considerable care was necessary in order to secure the passage of all the air through this by keeping all the joints of the apparatus tight. Most of the aspirations were of twenty-five litres of air which, passing this tube, presumably left all their particles in the distilled water. This water was added immediately after each

aspiration to a beaker-glass in which had been dissolved in 25 c.c. of distilled water the following, according to Dr. Angus Smith's formula—(following Koch)—of a culture solution :—

Distilled water = 25 cubic centimetres.

Gelatine (Cox's refined) = $2\frac{1}{2}$ p.c. or .625 of a gramme.

Sodium phosphate = 5 milligrammes.

This was finally placed in a test-tube with a stand, capable of holding 50 c.c.; an accurately fitting rubber cork (with a small piece of glass tubing drawn out to a small orifice below inserted in it, and in the tubing was placed a wad of sterilized cotton wool), sealed the test tube, while at the same time it allowed for the escape of gas through the wool.

It must be mentioned that the greatest possible care was taken that all parts of the apparatus were made antiseptic as far as any microbes, apart from those of the aspirated air, were concerned, by a standard solution of Bichloride of Mercury. By this method twelve test solutions were prepared for the purpose of determining the character of the forms which might develop in the putrefactive process which was likely to be set up in the culture solution. The behaviour of these solutions, and the bacterial forms which appeared in them are described in detail in the appended tables.

The second set of experiments, viz., that of collecting the atmospheric particles so as to calculate their numbers in a given volume of air was carried on by the same apparatus, modified so as to collect them on a microscopic slide.

This was attained by a modification of Miquel's process. Instead of drawing the air through distilled water it was drawn through a wide-mouthed funnel, drawn out at its other end to a narrow aperture of 1. mm. in diameter. This was fitted by a large rubber cork into a bell-jar with its base fitted accurately to a ground glass plate, through which was passed at its centre a tight fitting cork, into which was fitted a glass tube. The bell-jar, placed in position, was so arranged that the top of the cork in the glass plate supported a microscopic slide, on which a drop of a solution of glycerine and grape-sugar (Miquel's) was placed. The drawn out end of the funnel was brought to within 2 or 3 mm. of the drop on the slide. The glass tube, passed through the cork of the ground glass plate, was now attached to the aspirating apparatus already described, and the air, being drawn through, delivered its particles into the drop upon the slide. In this way a given number of litres of air delivered their particles in the sticky solution. Each slide was afterwards fitted with a cover-glass sealed with a solution of dammar resin in chloroform. Of such slides eight were prepared, taken at different hours of the day, and also on different days.

It is to be regretted that the time and opportunities did not allow of the examination of these slides at the time when prepared, as a more accurate idea could have been obtained of the forms collected. It has hence been impossible to do much more than estimate in a tolerably accurate manner the number of particles of atmospheric dust in a measured quantity of air. By a reference to the appended table, the variations in the different aspirations will be seen. While the greatest possible care was taken with these preparations, it must be noted that they were made under very great difficulties, since they were of necessity taken in the open air, with a wind blowing part of the time at probably twenty-five miles an hour. The wind was broken in some degree by bushes, and pieces of canvas; but great difficulty was experienced in carrying out, at all well, necessary manipulations. Regarding these, as the other experiments, it is to be regretted that they were so few in number and incomplete in details. I here take pleasure in expressing my appreciation of the aid lent me by Mr. C. F. Durand, 4th year student in the Science Department of University College, in the carrying out of these field experiments.

Tables, showing the results of the addition of solutions, through which the air has been drawn, to standard gelatine solutions.

Test Solution No. 1.—25 litres of air, 25 c.c. distilled water, 25 c.c. gelatine solution. Made September 3rd, 1883; 12.45—1.20 p.m. Wind from North-West.	Test Solution No. 2.—25 litres of air, 25 c.c. distilled water, 25 c.c. gelatine solution. September 3rd, 1883; 2.45—3.15 p.m. Wind from South-West.	Test Solution No. 3.—50 litres of air, 25 c.c. distilled water, 25 c.c. gelatine solution. September 3rd, 1883; 3.30—5.30 p.m. Wind from South-West.
Appearances—	Appearances—	Appearances—
September 4th—one day after.—Solution perfectly liquid and clear, except slight sediment, perhaps from gelatine.	*September 4th—one day after.*—Gelatinous, perfectly clear, excepting four bubbles, and minute white particles evenly disseminated through solution.	*September 4th—one day after.*—Almost solid; very clear; no bubbles except two minute ones near upper part of tube. On examination with hand lens minute whitish particles appear throughout whole solution.
September 8th—five days after.—Perfectly clear, two bubbles (air?) toward upper part of tube; lower portion darker with whitish particles.	*September 8th—five days after.*—Clear; one bubble in upper portion; small whitish particles present.	*September 8th—five days after.*—Clear, whitish particles throughout.
September 13th—ten days after.—Perfectly fluid, with flocculent, whitish appearance on the upper surface of the solution.	*September 13th.*—Solid, no change from preceding.	*September 13th.*—Rather fluid, with feathery appearance in middle part of solution; upper part clear, lower granular.
September 14th—eleven days after.—Whitish granules—lower two inches, flocculent to a considerable extent; a film mobile and sinuous in outline is apparent at upper flocculent part.	*September 14th.*—Solid, clear, no change apparent.	*September 14th.*—Film for ½ an inch; upper ¾ in fluid; film is fungoid in appearance.
September 18th—fifteen days after.—Fluid and clear except a flocculent-fungoid appearance half an inch from the bottom of the solution.	*September 18th.*—Clear, except filaments here and there—solid; upper surface covered with a dense white mass (mycelium) over half its extent; this part is slightly fluid.	*September 18th.*—Fluid and clear except the lower third with filaments here and there.
Microscopic Examination—	Microscopic Examination—	Microscopic Examination—
September 27th.—The upper layer of solution at 600 diameters shows an abundance of bacterium termo very active. Bacilli are much less numerous—of much the same thickness but two or three times longer than B. termo, usually bent—in some cases moniliform chains of bacilli are seen. The middle of the solution shows the same forms both quiescent and active. The bottom of the solution shows similar forms but without movement. The bottom of the solution is flocculent, consisting of the above forms quiescent, and shreds of organic materials and inorganic particles. Similar forms and particles to some extent are seen in other parts of the solution.	*September 29th.*—Thick mycelium formed at top found to consist of bacillus; many octohedral crystals from liquid in lower part of solution. Abundant spores in the solution from the fungus of the surface. Bacteria very rare.	*September 29th.*—Shows an abundance of what seems B. termo, in a wholly quiescent state. Here and there is a bacillus similar to those seen in No. 1; show slight movements; no differences distinguishable between upper and lower parts of solution.
	October 11th.—Examination of fungus, cultured in gelatine solution in free air, shows constancy of the threads already mentioned; octohedral crystals continue to be abundant.	

Test Solution No. 4.—25 litres of air; 25 c.c., distilled water; 25 c.c. gelatine solution.—September 3rd, 1883; 6 p.m.—7 p.m. Calm.	Test Solution No. 5.—25 litres; 25 c.c. distilled water; 25 c.c. gelatine solution. September 3rd, 1883; 7—7.30 p.m. Calm.	Test Solution No. 6.—25 litres; 25 c.c. distilled water; 25 c.c. gelatine solution. September 4th; 6.30—7 a.m. Wind, south-west; stiff breeze.
Appearances—	Appearances—	Appearances—
September 4th—one day after.—Quite liquid; upper portion perfectly clear; lower part dim with many minute bubbles.		
September 8th.—Upper $\frac{1}{3}$ perfectly clear. In upper part of the solution, and in the glass tube of the cork, are numerous bubbles. Lower $\frac{2}{3}$ darker, with many scattered, whitish particles, and two large patches.	*September 8th—five days after.*—Five large bubbles, two medium, two small; clear; numerous particles around cork; numerous particles, white, throughout.	*September 8th.*—Clear; has no bubbles at all; has a few white, scattered particles.
September 13th.—Rather fluid; feathery in middle part of tube. Its upper portion has particles; lower, granular.	*September 13th.*—Four bubbles in upper part of lower half of solution; mass very gelatinous.	*September 13th.*—Solid; no change evident in any part of tube.
September 14th.—Upper two inches fluid and clear. Below this is a layer of a dark feathery appearance. Below this it has a more gelatinous consistence, and slight yellowish tinge.	*September 14th.*—Shews in upper quarter of inch a flocculent, fungoid appearance at surface; rest solid and gelatinous. Three bubbles in lower part of upper half; one has risen to mouth of tube.	*September 14th.*—Shows no change.
September 18th.—Upper half fluid and clear. Upper $1\frac{1}{2}$ inches of lower half (solid) has a dirty flocculus present. Its lower part is clear.	*September 18th.*—Gelatinous; whole is clear; but the upper surface has mycelial patches.	*September 18th.*—Upper half-inch clear and fluid. Dark filaments appear here and there in the solution.
Microscopic Examination—	Microscopic Examination—	Microscopic Appearances—
October 1st.—Surface is liquid and clear; has a marked amount of dust. Some particles of an irregular hexagonal shape are here seen. Bacteria motile, and in zooglea masses; bacteria, probably micrococci, single, sarciniform and in moniliform chains. From bottom, the forms are motionless and in chains (micrococci) rare. Dust particles, six-rayed and star-shaped are seen.	*October 3rd.*—A small mycelium in several patches is on surface, but without spores, not having fruited. The upper layer of solution shows, in addition, bacteria in zooglea stage; also separate bacilli, comparatively few, are present (same as in No. 1). Standard iodine solution added appeared precipitated in amorphous masses, and also in hexagonal plates. The forms of lower layer closely resemble bacilli of upper part. Sluggish bacteria of micrococcus form were the only ones present.	*October 3rd.*—Shows mycelium similar to that in No. 2. growing on under surface of the cork. The upper inch of the solution, which was fluid, showed bacteria in zooglea stage of various appearances. Bacteria and bacillus (?) forms appeared at half-an-inch below the surface; also, micrococcus forms. The lower portion of the solution is gelatinous; the bottom showing but few evidences of life, these being micrococcus forms mostly, possibly some bacteria.

TEST SOLUTION No. 7.—25 litres, 25 c.c. distilled water; 25 c.c. gelatine solution. September 4th, 7.45—8.30 a.m. Stiff breeze south-east.	TEST SOLUTION No. 8.—50 litres, 25 c.c. distilled water; 25 c.c. gelatine solution. September 4th. Stiff breeze south-east.	TEST SOLUTION No. 9.—25 litres, 25 c.c. distilled water; 25 c.c. gelatine solution. September 4th, 7.30—8 p.m. Air heavy; heavy thunderstorm.
APPEARANCES— *September 8th.*—Clear—two large bubbles, one at upper part, one at middle of tube, six medium size, five small ones occupying the central portion. It contained numerous disseminated whitish particles. *September 13th.*—Solid—one large and two or three smaller globules in the lower part of the upper half of the solution; one large globule is seen at top of solution. *September 14th.*—Shows no change from previous day. *September 18th.*—Wholly solid and clear, no change.	APPEARANCES— *September 8th.*—Clear—one small bubble in upper portion, numerous whitish particles especially at lower end, where they are comparatively large. *September 13th.*—Flocculent in upper $\frac{3}{4}$ inch of solution-fluid, the rest is gelatinous. *September 14th.*—Fluid for upper $\frac{3}{4}$ inch; of this the upper layer is misty, while the lower is fungoid in appearance. *September 18th.*—Fluid misty, some flocculi in bottom of the solution.	APPEARANCES— *September 8th.*—Clear, especially upper portion which is watery, like No. 4. Lower two-thirds with numerous whitish particles, no bubbles. *September 13th.*—Upper half of solution clear and fluid, lower half gelatinous and misty. *September 14th.*—Upper half fluid and clear except toward its lower part, which begins to show a feathery appearance. *September 18th.*—Upper half fluid and clear, lower is gelatinous, dark flocculi and filaments thickly disseminated through it.
MICROSCOPIC APPEARANCES— *Oct. 4th.*—Solution gelatinous throughout. Abundance of motionless bacteria and a few bacillus forms similar to those already seen. No micrococci are seen. A few inorganic particles were present. The bottom of the solution shows but few forms, these being wholly bacteria.	MICROSCOPIC APPEARANCES— Not recorded.	MICROSCOPIC APPEARANCES— *October 6th.*—Solution is very fluid; has on upper surface a mycelium consisting of abundant threads, which show a brownish appearance; are jointed with constrictions, and contain spores. The upper portion contains, besides, swarms of bacteria; some octohedral crystals being also present. The lower half, an inch below the surface, shows the same forms; has abundant single bacilli and swarms of bacteria. They have very sluggish motion. Middle layer shows abundance of motionless bacteria and mycelial threads.

Test Solution No. 10.—25 litres, 25 c.c. distilled water, 25 c.c. gelatine solution.—September 5th, 1.30—2.10 p.m.	Test Solution No. 11.—50 litres, 25 c.c., 25 c.c. gelatine solution.—September 5th, 2.30—3.30, p.m.	Test Solution No. 12.—25 litres, 25 c.c., 25 c.c. gelatine solution.—September 5th, 7.15—7.30 p.m.
Appearances—	Appearances—	Appearances—
September 8th.—Quite thick but clear; solution divided into two portions, upper and smaller portion connected with lower by a film along the side of the tube. The lower portion has numerous white particles, with a distinct brown colour at its lowest particle. Both have numerous bubbles, some of large size.	*September 8th*—This tube broken at cork and some of its contents had escaped—is clear, with numerous white particles, has no bubbles except on upper surface.	*September 8th.*—Clear, shows two or three bubbles, numerous white particles. (In all except nine and four the solutions are quite thick and gelatinous, probably from low temperature, which may have effect of retarding growth of germs.) This night there is the first hard frost of the season.
September 13th.—Upper $\frac{2}{3}$ fluid, lower $\frac{1}{3}$ solid. A few flocculi, where they meet.	*September 13th.*—Upper $\frac{1}{2}$ fluid, lower $\frac{1}{2}$ gelatinous, a few flocculi where they meet.	*September 13th.*—Solution perfectly solid and consistent throughout.
September 14th.—Wholly fluid; lower $\frac{1}{2}$ inch is yellowish, somewhat flocculent.	*September 14th.*—Upper $\frac{1}{2}$ fluid and clear, lower $\frac{1}{2}$ gelatinous, except at its upper part which has a flocculent, fungoid appearance.	*September 14th.*—Upper inch is fluid but dusty; upper $\frac{3}{4}$ of solution beginning to show flocculi.
September 18th.—All fluid, except lower $\frac{1}{4}$ inch, is yellowish with dirty fungus and moss present.	*September 18th.*—Upper $\frac{2}{3}$ clear and fluid, lower $\frac{1}{3}$ has flocculi in its upper part dirty in appearance.	*September 18th.*—A few dirty flocculi at bottom. the rest is clear and fluid.
Microscopic Appearances—	Microscopic Appearances—	Microscopic Appearances—
October 11th.—Very fluid, flocculent at the bottom. Upper layer is crowded with bacteria in zooglea stage, also free forms resting for the most part. Here and there bacillus threads appear leptothrix in form. Brownish masses in zooglea form present in many parts—varying in size—focussing shows granules in the masses, apparently single bacteria. Middle portion of solution shows complete occupation by bacteria in very sluggish condition. The same must be said of the lower layer.	*October 11th.*—Very fluid, white sediment, flocculent at bottom. Upper layer of solution is crowded with bacteria, large, quiescent or sluggish in movement; some bacilli of the ordinary form straight or slightly curved. The middle layer shows abundant bacteria in zooglea masses.	*October 11th.*—Very fluid, dense white flocculi, with sediment at the bottom. The upper layer is crowded with bacteria, many in zooglea stage, and brown protoplasmic patches. Middle layer shows abundance of bacteria largely motionless, with occasionally single bacteria. Lowest layer shows abundance of bacteria, sluggish, and in zooglea stage; some bacilli single in bent rods.

The results of the culture of the organisms collected from the air, as set forth in the above tables, are given as far as their examination has been carried on as determined by myself, along with T. McKenzie, B.A., Fellow in the Biological Department of the University, whom I have to thank for constant assistance in this and in many other scientific matters.

By reference to the notes in the above tables it is seen that more or less regular stages were noticed to follow one another in the appearance of the gelatine, and that they correspond with what Dr. R. A. Smith has indicated in the influence on gelatine of sewage water. These are :

1. Spheres full of transformed gelatine, this being effected by organisms.
2. The surface liquefaction of the gelatine caused by the same means.
3. The gradual softening of the gelatine.
4. The evolution of a gas which is combustible, not always marsh gas.

These results will be still better seen by quoting one of Dr. Smith's experiments.

" Specimen 2:—25 c.c. gelatine + 25 c.c. Manchester water + 5 mgms sodium phosphate.

After one day the tube contained a few specks.

After two days a number of minute spheres, not to be counted, appeared, and a turbid band was formed near the surface of the jelly which was rich in living bacteria.

After three days spheres became larger and the whole of the gelatine was affected : a number of gas bubbles appeared also.

After four days air spheres had risen to the surface, bacteria spheres disappeared, leaving the liquid jelly turbid and smelling offensively ; liquid and alkaline.

From some filtrations of the water of the Grand River taken at the station where my experiments were carried on, and which were added to a gelatine solution, similar appearances to the above were obtained. Thus the notes of one solution found in my note-book are as follows :

September 13th. Upper inch fluid, rather misty ; lower part with many bubbles, gradually rising to the surface. The middle part of the solution is dirty.

September 14th. Upper $\frac{1}{4}$ fluid, bubbles numerous throughout, but less than on the previous day, and smaller in size. Many flocculent masses appear in the solution.

September 10th. Whole solution is misty, lower half has dirty flocculi, and many bubbles, readily rising to the surface. Its upper half has a greenish yellow mould-like film ; the whole is fluid.

Selecting from Dr. Smith's remarks, I find him stating :—

"The distilled water (gelatine) solution . . . . shows nothing, whatever, at least after many days, if the gelatine is well covered with solid paraffine, or with olive oil, or with mercury, or even, if great care is taken, by stopping the tube with cotton-wool only.

" A few spheres of liquid gelatine seem to be producible by matter in the air. From air washings taken near my laboratory an entirely different set of microscopic objects were obtained."

" A greater number of spheres are coincident in Manchester water with some sensible inferiority in the supply." . . . . "At such times the water is highly impure and is complained of by the public. We have a very easy proof therefore of the value of this test. However we must be careful in drawing conclusions as to the wholesomeness of the water tried. The existence of spheres of transformed gelatine caused by organisms is no proof that the water is unwholesome, although fewer are better, as a great excess occurs with some inferior water. On the other hand the entire absence of these spheres may be caused by sewage or want of air. . . . "The globules do not show themselves in strong sewer water, but the whole mass becomes turbid and the surface of the gelatine becomes liquid and full of life. This liquid condition gradually increases until the whole is reached. We have therefore two striking conditions well marked out."

"A third may be said to exist, but it is often a mere beginning of the globules. This is shown by the formation of a small opaque point. If this point is examined it is seen to be full of life like the lower part of the spheres, and the fluid portion of the gelatine, when this fluidity begins on the surface."

From these extracts it must be plain that the fact is definitely established that organisms, whether in air or water, developing in gelatine give rise to changes in its con-

stitution. While we find Dr. Smith stating that the organisms obtained from the air are of a largely different nature from those developed by adding sewage water to the gelatine, yet inasmuch as he has given no indications as to what these are, and has not given us any account of the bacteria present in his solutions, we must await further information.

But it is quite evident that as a general rule the greater the number of organisms introduced into the gelatine solution, the more rapid will be the changes which it undergoes providing oxygen from the air can reach the surface of the solution.

Regarding the experiments carried on in the Grand River air, the points of interest were three :—

(1.) Would organisms be found in the air there capable of setting up putrefaction in the gelatine?

(2.) Would their number, as seen from their effects, vary according to any well defined circumstances ?

(3.) What the character of these organisms might be ?

We have seen that there can be no question about the first being definitely settled, viz., that atmospheric organisms produced decomposition in the solutions.

Regarding the second point, that of determining something definite regarding their number by the rapid and extensive putrefaction set up by them in the solution, in the same way as Dr. Smith has determined the impurity of water by the rapidity and completeness of the putrefaction, there are reasons why I should speak with much diffidence.

It would have been better if a double set of experiments had been carried on together so that the solutions might have been examined microscopically regarding their organisms at various stages of the putrefaction. Circumstances did not admit of this. We have, however, as regards the intensity of putrefactive changes, Dr. Smith's method of testing this point, which in some ways is satisfactory, viz., the appearances at different stages of the solution itself.

But inasmuch as it is quite possible that different organisms may in different degrees promote these changes, the mere difference in intensity of the putrefactive process is not wholly satisfactory. As however aspirations taken at the same station at successive hours of the same and following days ought to contain in large measure the same forms, this is perhaps an unnecessary refinement, as indeed is proved by the forms which appear in the microscopic examination of the various solutions.

Examining these solutions from the aspirations taken on September 3rd, it appears that Nos. 3, 4 and 5 taken toward evening show, say up to the 13th when examined, more changes than take place in Nos. 1 and 2. No. 3, however was of 50 instead of 25 litres of air. No. 6, taken early in the morning when the dew lay very heavy on the grass, shows up to the 13th very slight changes. Similarly No. 7, does not show much change up to this date. No. 8, containing 50 litres, taken when the wind was very high and the dew had disappeared, shows very marked changes by the 13th. No. 9, taken in the evening of this very windy day shows great changes. Nos. 10 and 11, taken the day after a strong wind, ending with a thunderstorm in the evening, but taken after noon, show much change. This is certainly unlooked for, but as will be remembered the wind was blowing from the land or from the town side. No. 12, taken in the evening of the same day, shows on Sept. 13th very little change. The wind had fallen.

It would seem from these results that the wind has an all powerful influence in determining the abundance of particles in the air. That as seen on the morning of Sept. 4th, its effects are much less as long as the ground is wet, as with a heavy dew, and that toward evening the number of atmospheric particles regularly increases.

At the period at which the microscopic examination of these solutions was made, more than three weeks after the aspirations were taken, all of them were in full putrefaction.

There are however, some differences in the forms which are present, with a certain behaviour of the solutions, which are both important and interesting. Thus Nos. 2, 5, 6, remain largely gelatinous throughout. In all of them a mycelium has developed on the top of the solution. From the appearance of the threads under the microscope they are apparently bacillus forms. In all, bacteria while not absent are notably very few. In No. 9, we again notice that the upper surface has a mycelial growth present ;

but the solution is very fluid, and this condition began early. Bacteria are however noticed to be swarming in the solution. It would seem then that the transformation of the gelatine into the fluid state, depended largely upon the solution having been taken possession of by a Bacterium—probably B. Termo ; and that when some bacillus form began to grow on the surface, bacteria had but small opportunities for development : as we see in every instance, except No. 9, that bacteria were noticeably few in number.

The fact that the threads in No. 2 resemble some of those figured by Klebs and Thomasi-Crudeli, may be mentioned incidentally ; but I do not wish that any importance should be attached to a point which has not been developed, as it ought to have been had opportunities permitted.

Many other points of interest might be gleaned from these imperfect experiments, but I shall leave them to those whose opportunities are greater to draw other conclusions such as the facts seem to bear out.

TABLE showing the number of Atmospheric Particles to a given amount of Air.

No. of Aspiration.	No. of Litres.	Average No. in field of 10 M. M. in Diam. at 750 Diam.	Average Total No. on Slide.	Hour and Day of Aspiration.	Character of Particles.
Slide No. 1	25	15	2160	Sept. 4th, 1.30-2.15 p.m...	Some micrococcus-like forms; amorphous organic particles; " inorganic "
Slide No. 2	25	10	1440	Sept. 4th, 2.45-3.30 p.m...	Largely amorphous protoplasmic particles.
lide No. 3	50	80	11520 (av. 5760)	Sept. 4th, 4.15-5.45 p.m...	Micrococci very abundant (probably also bacteria) ; many fine inorganic particles ; a few septate fungoid spores.
Slide No. 4	25	50	7200	Sept. 4th, 6.45-7.15 p.m...	Numerous micrococci, also confervoid spores.
Slide No. 5	25	30	4320	Sept. 5th, 10.45-11.45 a.m..	Many inorganic particles, also amorphous organic particles; some micrococcus-like forms.
Slide No. 6	25	5	720	Sept. 5th, 12.30-1 p.m.....	Mostly amorphous protoplasmic particles.
Slide No. 7	50	10	1440 (av. 720)	Sept. 5th, 3.30-4.30 p.m...	Several moniliform micrococcus-like chains, 4-2, etc.; other particles protoplasmic
Slide No. 8	30	25	3600 (av. 1800)	Sept. 5th, 5-6.30 p.m.....	Micrococcus-like forms; septate fungoid spores.

Notes on the Tables.—As already mentioned, these experiments are by far too limited to establish any hypothesis upon; and yet they contain two facts of so much interest as to be worth noticing. As already mentioned, September 4th was a day with a very high wind blowing directly from the marshes, the wind at the same time sweeping across th river before arriving at our experiment station. Thus the sources of particles were tw —the marshes and the pulverized water particles from the river surface. o

First, then, the number of particles in the air increased very greatly toward evening on both days. (The exception of the morning of the 5th may be due to the fact of the excessive number of particles carried into the air the preceding day not having subsided.)

The second fact indicated is, that the organic particles, including micrococci, and some septate fungoid spores regularly increased towards evening.

On the evening of the 4th, a severe thunderstorm took place, which was succeeded by a day of great brightness, with the wind blowing from the land side, or from the direction of the town.

The great increase of particles, with the continuing wind of the first day, is natural enough; the great decrease of the particles of the next day, especially after the rain, might be fairly expected; and the second marked increase toward evening, of particles, coincides with the fact of the drying surface of the soil giving up its particles in increasing numbers to the breeze which blew steadily all day.

What relations these facts have to the remarks made on the causation of malaria can be seen by a reference to various preceding paragraphs of this report.

All of which is respectfully submitted.

PETER H. BRYCE.

ARTICLE VII.

REPORT OF THE COMMISSION APPOINTED TO VISIT LONDON AFTER THE FLOODS OF JULY 11TH, 1883.

To the Chairman and Members of the Provincial Board of Health:

Gentlemen,—On the evening of the 10th of July last, the City of London and vicinity experienced one of the heaviest rainfalls ever known, extending over an area of 20 by 50 miles. The amount of this rainfall was from 3 to 4½ inches in depth, included in an area of a section of country drained by two branches of the River Thames, which run to the north and south of the city and meet to the west thereof. In consequence of the total inability of the existing channels to carry away the immense volume of water, all the lowlands in the neighbourhood of the city were flooded, and the village of London West submerged.

The fact that the entire district which was flooded was found to be covered with a thick deposit of organic matter, of both an animal and a vegetable character, and that the cellars and wells of the village were polluted by similar deposits, made it appear probable that serious effects upon the health of the people of London West and the City of London were likely to follow. This being the case, your committee was deputed to visit the district and enquire into these matters and see what means were being taken to prevent such probable results. Arriving at St. Marys it was found that the flood had made further progress by railway impossible, hence I determined to drive to London along the course of the Thames and view the effects of the floods at various points. After some fourteen miles of a drive, I reached the village of Thorndale, where very serious evidences of the flood were apparent. A creek passing through the village had overflowed its banks, washing away fences, carrying houses from their foundations and depositing large amounts of *debris* at various points in the village and neighbourhood. Having there gained various particulars from Dr. McKechnie of that village, I proceeded to London and communicated my arrival to the Mayor and members of the Health

Committee. The next morning, along with the Mayor and various members of the Committee, I proceeded to view the flooded district.

The effects of the flood were abundantly evident, not only in the wrecked houses, but also in the enormous mass of *debris* and in the fact of the soil being, in many places, covered with organic materials in ponds of water of varying extent, and in the complete saturation of the walls of the houses to a height of some eight feet, and in the general flooding of the cellars and wells, as already noted.

The visit being made six days after the flood, organic decomposition had gone on to some considerable extent, as was evinced by the disagreeable odours pervading many streets and yards. I cannot better describe the conditions presented than by the words used by myself in addressing a public meeting of the Health Committee and medical profession of the city held in the city hall the evening of my visit:—

"Speaking, then, gentlemen, I would say that the calamity which so suddenly overtook London West is in its nature, I believe, unparalleled in the history of Ontario. Hence, we must remember that we are in some degree discussing an extraordinary state of affairs. Nevertheless, it is true that the unfortunate district has been for a long time subject to floods, and that frequently much damage to property has resulted. Hence, the residents of the district cannot wholly exonerate themselves from a certain responsibility in the matter, from not having before either been very chary about submitting themselves to dangers, or, if they must live there, to the task of providing against possible floods. But passing over this point, let us deal with the

EXISTING STATE OF AFFAIRS.

What is, then, the exact condition of affairs present?

1. We have a flat district in the bend of a river, rising from ten to twenty feet above the level of the stream.

2. We have it consisting of a sandy loam, overlying a gravel sub-soil, almost on the level of the river.

3. We have houses of people mostly of the working classes, many of which are built of frame without stone or brick foundations.

4. Many of them have cellars not very well constructed.

5. All have shallow wells, going down to the gravel, through which water readily percolates for many feet.

6. Privies of the most ordinary character—a hole in the ground into which water percolates, and may thence drain into the nearest wells.

7. I believe there is no system of public drains or sewers; all surface water becomes very largely sub-soil water, and hence, along with privy drainage, is that which supplies drinking water. Such, we may say, were the conditions prior to the flood. What have we additional?

1. Not only a soil saturated with water, but considerable amounts of surface water still standing in gullies and washouts.

2. In addition, we have not only wood, grass and rubbish of every kind heaped up here and there, but we have a considerable amount of animal organic matter from manure heaps and privies, washed not only into depressions where there is more or less stagnant water, but into wells and cellars, and soaked to some extent into the ground.

3. A third, and one perhaps of the most importance, is the wholly damp and soaked conditions of the walls of the dwellings.

Such conditions, I think all will agree, are sufficiently serious to cause not only those immediately affected to think seriously of what is to be done, but also to make those having the public weal in any way at heart to take common action with the sufferers.

What, then, are the points to be attended to?

1. Feed the sufferers.
2. Clothe the destitute.
3. Encourage them to dry and cleanse all goods not carried away.
4. Regarding the premises, to remove everything which, when damp, would decompose.

These are serious tasks.

Regarding the first two I need not speak. The appeals to human charity and generosity have been of late too many and affecting not to find a response in the hearts of the hundreds and thousands of inhabitants of this fair city. Regarding the appeals to the people themselves, we must expect much, since the aid lent them must surely prove the best practical teacher in such matters. But, nevertheless, all outside aid to be useful depends upon thorough organization.

This has been and is being done. Considering the part I have been more specially engaged in viewing, the Reeve and his Council of London West have undertaken the care of repairing and removing obstructions from the streets.

1. A committee of the city council and of citizens of London, I find, have made a house-to-house visitation, and have noted the condition and needs of the inmates of each.

2. They are employing the city engineer to pump the water from the cellars and wells.

3. They have gangs of men engaged in cutting courses for the standing water, and leading it to the river. And, gentlemen, I say all honour to the sentiments which have prompted, to the time which has been given, to the money which has been freely spent, and to the hands which have worked in this great mission of mercy.

But, gentlemen, I believe that it is at the point where such work ends that the real work of the sanitarian begins. Let us review the situation.

1. The houses, being cleansed, people will go back to them; the walls are damp both in house and cellar, and there will of course be more or less organic matter in the houses. The germs of disease, as fungoid plants, find in such conditions very ready means of propagation; and hence, with the dampness, will be required constant ventilation of cellars and houses by day and night, if most serious results are not to follow.

2. But again, we must expect that once the wells have obtained clear water the people will use them. If it be true that the soil is soaked with organic materials carried into it, it will follow that such will filter into the wells. With matter decaying with the hot summer weather, diseases promoted or originating in bad water will very probably follow. In connection with this subject, I cannot too earnestly urge that the people be not only warned but absolutely prevented from using for drinking purposes any but city water. The public spirit which aids the distressed must go further and remove if necessary the means of future danger. Remove the pumps, and city water must be used. Such is what seems to me absolutely necessary to be done by the relieving and health committees.

But now I must refer to the larger and more important question of what is to be the future of London West.

There are three, and I think only three, possible futures for it, viz.:—(1) Allowing everything to settle down into the old way; (2) let the residents move away to higher ground; (3) protect the district, if possible, against future inundations, and develop sanitary improvements. Regarding the first, the great proportion of the people are too poor to make it possible for them to move away, find new houses and new homes; and, moreover, they are too much attached to their little parcels of land to make them think of it. Their losses as a municipality will make them unwilling to introduce city water, build good privies, and expend much on public sewers. In fact, what has been will be, unless the citizens of London, with the council of London West, move and move strongly in the matter.

2. With regard to their moving away, I do not think this is a plan which the local council or city will advise, or could do much in favour of were they to advise it.

3. We have then, it seems to me, but one remedy left, and that is to protect the district by a breakwater and dyke.

Now, gentlemen, you must be aware that I, as representative of the Provincial Board of Health, can be here only in an advisory capacity. Nothing else is needed, nor, perhaps, very desirable. Government in Canada is essentially government of the people by themselves, and I am not prepared to say that it is a matter to be referred to the Government as to whether it would undertake the work of protecting the people of

London West, by a money grant, for the purpose of relieving their present distress. But what I do say is, that should the Government of Ontario grant any aid to West London, it ought to be in the way of permanent improvement for preventing, by dykes, the yearly floods.

In conclusion, I must express the pleasure at all I have seen, but sincerely hope and earnestly urge that the fathers of the people will now organize, on some extended and permanent basis, Local Boards of Health in both municipalities, which will enter upon the work of sanitary reform concerning the proper disposal of sewage, the universal use of good water, and the many other matters necessarily coming under the jurisdiction of such Boards."

From the remarks of Dr. Waugh and others, I have obtained fuller information regarding what have been the results of the efforts of the local authorities regarding the improvement of the condition of the flooded districts.

It was, therefore, at last decided that the Committee would give all the assistance they could to improve the sanitary condition of those houses which had to be occupied at once. The Health Committee, acting with the Relief Committee, made arrangements to have the work done as quickly as possible. Several large pools of stagnant water which remained were drained and tiles put in, thus making a permanent improvement, and the surface covered thickly with chloride of lime. All the refuse matter and rubbish was collected in a heap, covered with tar, and burned. The deposits on the streets were collected in heaps, disinfected, and removed; the grounds around the houses were raked over and sprinkled with lime. The refuse from the houses was removed without delay, the floors thoroughly washed, and fires kept up to dry the houses as soon as possible. The wells and cellars were pumped out, and all the refuse removed and disinfected. In this way the bad odour from the deposit was greatly lessened, and many of the houses were fairly habitable. The people were all willing and anxious to use every means in their power to have their dwellings brought into a good sanitary condition, and any suggestions made by the inspecting physicians were at once carried out if possible.

Such were the means taken to prevent an outbreak of disease, and the result is very satisfactory to all who assisted in carrying out these means.

It is instructive to know how much can be done by comparatively little expense in health matters, if thorough and local action is carried out.

For this purpose I have obtained, through the kindness of W. Saunders, Esq., London, a detailed account of the principal expenses connected with the sanitary improvement of the flooded district.

The following is his statement:—

Sanitary expenditure in connection with the Thames Flood.

Labour	$94 00
Disinfectants, including tar and oil	113 80
Tile and lime	107 39
Labour: fuel and teaming, with fire engine	122 02
Laying and hire of pipe for water	272 79
Paid owners and tenants for cleaning and disinfecting cellars, etc.	2,125 25
	$2,836 15

"The first item of labour covers the expense of ditching to carry off surplus water which was a *most important* measure, seeing that the accumulation of filth in the water was very great. Some of these ditches were made into permanent drains by the expenditure of $107.39 for tile and lime, and under the item of disinfectants is included about $50 for coal tar and petroleum oil used to assist in burning such accumulated rubbish as could not otherwise be got rid of. The steam fire engine was kept constantly at work for several weeks; in the first place, to remove such ponds of stagnant water as could not be drained, and subsequently to pump the filth from wells and cisterns and thus prepare the way for their more thorough cleansing. The item of $272.79 for hire of pipe and laying, was to supply the flooded district temporarily with city water. This

supply was continued to London West without charge by the city until the frost required the removal of these surface pipes in early winter. You understand all about the item for disinfecting cellars, etc. The disinfectants used were chiefly of the inferior sorts, such as chloride of lime and sulphate of iron, of which several tons were consumed. Lime was also plentifully supplied as long as the supply was deemed necessary."

Further comment on the efficiency of the work carried on by the local health authorities and citizens' committee is unnecessary. It suffices to say that their action is worthy of all praise, and recommends itself to all local authorities whose district may be visited by any similar calamity.

All of which is respectfully submitted.

P. H. Bryce.

APPENDIX C.

Article I.

COPY OF CIRCULAR TO THE CLERKS OF MUNICIPALITIES AND MEDICAL CORRESPONDENTS OF THE BOARD, AND ANSWERS THERETO.

No. 10.] Office of the Provincial Board of Health,
Toronto, May 30, 1883.

Dear Sir,—It is the intention of the Provincial Board of Health to issue a series of circulars for the purpose of collecting information with regard to various subjects connected with the public health. The replies to these circulars will, it is hoped, be of great value in advancing the work of sanitary improvement. In pursuance of the object indicated, the following questions have been framed, bearing upon the general sanitary conditions of municipalities and the work of local health organizations.

The Board would feel much obliged if you will be good enough to fill in the blanks and return the circular to the Secretary as soon as possible.

Two forms are sent you, one of which it will be convenient for you to retain for future reference.

I have the honour to be, your obedient servant,

Peter H. Bryce,
By Order of the Board. *Secretary.*

Questions.

1. State the name of the municipality, city, town, or incorporated village, in which you reside.

2. Have you any Local Board actively engaged in matters relating to the public health?

   (*a*) If so, what objects have engaged its attention during the past year?
   (*b*) Has it appointed any Health Officer?
   (*c*) If so, is he a medical man?
   (*d*) Is he a salaried official?

3. What is the usual method employed in the disposal of excreta?
4. If privy-pits are employed, is any by-law regarding them enforced?
5. At what distance are they situated from wells?
6. Have any cases of disease been traced to their presence?
7. Have any *dry-earth* closets been introduced?
8. How is slop-water disposed of?
9. How is vegetable and other dry *refuse* disposed of?
10. Have any cases of disease from such disposal been observed?
11. What is the chief source of water-supply in your municipality?
12. How is such supply affected by *excreta* and other *refuse*?
13. Is your water-supply affected by pollution of streams and rivers?
14. Is it affected by privy-pits, soil pollution, etc?
15. Have any cases of disease from contamination of drinking-water come under your observation?
16. How many cases of the following diseases have come under your notice during the past year, and how have they been propagated?

   (*a*) Small-pox (*d*) Diphtheria.
   (*b*) Scarlet Fever. (*e*) Whooping-cough.
   (*c*) Measles. (*f*) Typhoid Fever.

17. What precautions are taken in your municipality in regard to *isolation*, disinfection of clothing, houses, etc.?

18. To what extent do you think the number of cases might have been reduced by proper systematic precautions?

19. Have children to present medical certificates before re-admission to school in cases where contagious diseases have existed in the family?

20. What extent of (*a*) swamp, (*b*) drowned land, (*c*) stagnant water exists in your municipality?

21. Do any nuisances, such as neglected slaughter-houses, etc., exist in your municipality?

Answers to Questions.

ALGOMA.

Number of municipalities in District, 11. Number returning answers to questions, 5.

1. *Oliver Township.* 2, No. 3. Pits. 4. None. 6. None. 7. No. 8. Some distance. 9. Cleaned up yearly. 10. No. 11. Creeks and wells. 12. No. 13. No. 14. No. 15. No. 16. None. 20. One-tenth swamp. 21. None.

1. *Howland.* 2. Is appointed—none active. 11. Lake Huron. 13. No. 14. No. 16. *d* ten, *f* not known.

1. *Assiginack.* 2. No. 3. As found convenient. 4. No. 5. No. 6. Don't know. 7. No. 8. As most convenient. 9. No order observed. 10. Yes. 11. Springs. 12. None. 13. No. 14. No. 15. None. 16. *b* twenty-one, *f* two; dirt, bad diet, careless living. 18. Scarlet fever very prevalent, three deaths in one month. 19. No. 20. *a* one-third, *b* one-tenth, *c* one twenty-fifth. 21. None known.

1. *Sault Ste. Marie.* 2. None. 6. No. 7. No. 10. No. 11. Natural springs. 20. About one thousand acres. 21. None now.

1. *Caernarvon.* 2. No.

BRANT.

Number of municipalities in County, 7. Number returning answers to questions, 4.

1. *Brantford City.* 2. Yes. 3. For manure, carted from city. 4. Canal Company empty them three or four times a year. 5. Too close in some places. 6. Difficult to trace. 7. A few. 8. Underground trench. 9. Carted away. 10. Not known. 11. Wells. 12. Often impure. 13. No. 14. Yes. 15. Hard to trace. 16. *a* none, *b* six, *c* twelve, *d* eight, *e* five, *f* six. 17. No good system. 18. A large per cent. might. 19. Yes. 20. *a* out of city, *b* a few lots, *c* yes. 21. A few.

1. *Town of Paris.* 2. No. 3. Pits. 4. No. 5. 20 to 50 feet. 6. No. 7. Yes. 8. Pits, etc. 9. Burnt or manure. 10. None. 11. Springs and wells. 12. Slightly affected. 13. No. 14. Slightly affected. 15. In the use of river water. 16. *a* none, *b* six, *c* forty-four, *d* thirteen, *e* none, *f* two. 17. To disinfection, etc. 18. One-half. 19. Not always. 20. None. 21. Some occasionally.

1. *Town of Paris,* second reply. 2. No. 3. Pits. 4. No. 5. 20 to 50 feet. 6. None. 7. Yes. 8. Pits, etc. 9. Burnt or manure. 10. None. 11. Springs and wells. 12. No. 13. No. 14. No. 15. No. 16. *b* one, *d* two, *e* one, *f* one. 17. None. 18. All of typhoid and half of others. 19. Not always. 20. None. 21. Occasionally.

1. *Oakland.* 2. No. 3. Pits. 4. No. 6. No. 7. No. 9. Manure. 10. No. 11. Wells. 12. None. 13. No. 14. No. 15, No. 16. *b* one. 17. None. 19. No. 20. *a* one thousand two hundred and forty-five acres, *b* two hundred acres, *c* two hundred acres. 21. No.

1. *Onondaga.* 2. No. 3. Pits. 4. No. 5. Many yards. 6. Don't know. 7. No. 8. Thrown on the ground. 9. Dung hill or burnt up. 10. No. 11. Springs and

wells. 12. Not hurt. 13. Yes. 14. No. 15. Bad water brings on ague. 16. *c* one hundred. 17. None. 18. Isolation. 19. No. 20. Hundreds of acres. 21. No.

BRUCE.

Number of municipalities in County, 25. Number returning answers to questions, 14.

1. *Southampton Town.* 2. No. 3. Pits. 4. No. 5. 50 feet. 6. Don't know. 7. Don't know. 8. Thrown out and in privies. 9. Burned and in heaps. 10. No. 11. Wells. 12. Don't know. 13. No. 14. No. 15. No. 16. *b* twenty, *c* twenty, *f* six. 17. No precautions. 18. Can't say. 19. Not enforced. 20. No. 21. No.

1. *Chesley Village.* 2. *b* Dr. Cooke, *c* yes. 3. Pits. 4. No. 5. 30 feet. 6. No. 7. Unknown. 8. Very carelessly. 9. No rules enforced. 10. Not known. 11. Wells and river. 12. No. 13. Dead animals thrown in. 15. None. 16. *c* one hundred, *d* one. 17. None. 19. Yes. 21. Two.

1. *Tara Village.* 2. No. 4. No. 5. None very close. 6. No. 7. No. 8. Thrown out. 9. Burned. 10. None. 11. Wells. 13. No. 14. No. 15. No. 16. No. 20. No.

1. *Port Elgin Village.* 2. Yes, Village Council. 3. Cleaned out regularly. 4. Yes. 5. Some two rods. 6. None. 7. No. 8. No danger. 9. Removed early every summer. 10. No. 11. Wells and cisterns. 12. Doubtful if so affected. 13. No. 14. Very improbable. 15. No. 16. *c* one or two. 17. By-laws passed for such. 18. All. 19. Quarantine observed. 20. None. 21. No.

1. *Port Elgin Village*, second reply. 2. *b* yes, *d* $365 a year.

1. *Paisley Village.* 2. Yes. 3. Hauled away to distance. 4. Yes, by-laws. 5. 20 to 66 feet. 6. Yes. 7. A few. 8. Thrown out back door. 9. To cows, pigs and thrown out. 10. No. 11. Wells. 12. Affected at odd times. 13. No. 14. One or two cases. 15. No. 16. *b* three, *c* seventy-two, *d* thirteen. 17. By-law. 18. Diphtheritic cases less. 19. Yes. 21. No.

1. *Teeswater Village.* 2. The council. 3. Pits put on land. 4. Pits but no by-law. 5. 30 to 60 feet. 6. No. 7. No. 8. Thrown into yards. 9. Manure. 10. No. 11. Wells in rocks. 12. No. 13. No. 14. No. 15. No. 16. *b* twenty-three, *c* one, *d* twenty, *e* three, *f* two. 19. No. 20. *b* ten acres, *c* two acres. 21. Yes.

1. *Wiarton Village.* 2. *b* 13 persons, *c* M. D., yes. 3. Pits. 4. None. 5. Far away. 6. None. 7. None. 8. Can't tell. 9. Very little, used to create smells. 10. None. 11. Wells and springs. 12. Not much if any. 13. None. 14. No. 15. None. 17. None. 18. Can't tell. 19. None. 20. None.

1. *Amabel.* 2. No. 3. On the ground. 4. No. 5. Can't tell. 6. None. 7. No. 8. To pigs and on fields. 9. Burned if necessary. 10. None. 11. Springs, wells, and creeks. 12. No. 13. No. 14. No. 15. No. 16. *b* six, *c* three, *d* three. 17. No. 18. Can't say. 19. Yes. 20. Can't tell. 21. No.

1. *Brant.* 2. No. 3. Privy. 4. No. 5. Can't say. 6. No. 10. No. 11. Wells. 13, 14, and 15. No. 16. *c*, *d* and *e* a few. 17. None. 18. Can't say. 19 and 21. No.

1. *Elderslie.* 2. No. 11. Wells and springs. 12, 13, 14, and 15. No. 16. *b* a few, *c* a few, *d* odd cases. 17. None. 18. Can't say. 19. Yes. 20. *a* two thousand five hundred and eighty-six acres.

1. *Greenock.* 2, 3, 4, and 7. None. 8. To pigs and thrown out. 11. Wells. 12, 13, and 14. No. 15, 16, and 17. None. 20. One-half. 21. No.

1. *Kincardine Township.* 2. No. 3. None. 15 and 19. No. 20. *a* one thousand two hundred and sixty-five acres. 21. No.

1. *Kinloss.* 2. No. 3. Put on fields. 4. No. 5, 6, and 7. Can't say. 8 and 9. Thrown out. 10. Can't tell. 11. Springs. 12. Can't tell. 13. No. 14. In some cases. 15. No. 16 and 17. None. 18. Can't tell. 19. None. 20. *a* three hundred acres, *c* five hundred acres. 21. No.

1. *Huron.* 2. Ripley, yes; *d* yes. 3. Pits. 4. No. 5. Can't say. 6. No. 7. Very few. 8. Thrown out. 9. In manure piles. 10. Don't know. 11. Wells. 12. Don't know. 13. Not much. 14. Yes in places. 15. None. 16. *b* thirteen, *c* thirty-five, *d* seven, *e* twenty, *f* eight. 17. None. 18. 20 per cent. 19. No. 20. *a* one and a-half per cent. 21. One.

CARLETON.

Number of municipalities in County, 13. Number returning answers to questions, 4.

1. *Ottawa City.* 2. Yes, *a*, *b* and *c* yes. 3. Removed by pail and barrel system. 4. Yes. 5. No wells. 6. No. 7. Not many. 8. Removed in barrels. 9. Burnt or removed. 10. No. 11. Ottawa River. 12. Not as to be seen. 13. Water comparatively free. 14 and 15. No. 16. *b* few, *c* few, *d* many, *f* few. 17. Two hospitals. 18. Not to any great extent. 19. Yes. 20. Imperfect drainage. 21. Four slaughter houses in vicinity of city.

1. *New Edinburgh Village.* 2. Village council, *d* paid by work. 3. Ottawa takes it away. 4. Yes. 5. 60 or 65 feet. 6. No. 7, Yes. 8. All over. 9. Manure piles or carted away. 10. No. 11. Wells and water works. 12. Can't say. 13, 14, 15, and 16. No. 17. By-law. 19. Yes. 20 and 21. No.

1. *Fitzroy.* 2. No action has been taken by the Council relative to these matters. 16. *b* some. 17. None. 19 and 21. No.

1. *Marlborough.* 2. None. 3. Pits. 4. None. 5. 100 yards. 6. Don't know. 7. None. 8. To hogs and thrown away. 9. Can't say. 10. No. 11. Wells. 12, 13, 14, 15, and 16. No. 17. None. 18. No. 19. Yes. 20. One-fifth of township. 21. No.

DUFFERIN.

Number of municipalities in County, 7. Number returning answers to questions, 3.

1. *Shelbourne Village.* 2. No. 3. Pits. 4. No. 5. Distant sufficiently. 6 and 7. No. 8. Thrown on the surface. 9. Usual way. 10. No. 11. Wells. 12. Unknown. 13, 14, and 15. No. 16. *f* two. 17, 19 and 20. No. 21. One.

1. *Amaranth.* 2. No. 3. Pits. 4. No. 5. 200 to 300 feet. 6 and 7. No. 8. Thrown on ground. 9. Fed to hogs. 10. No. 11. Wells and springs. 12, 13, 14 and 15. No. 16. *c* one, *e* six. 17. Pure air. 18 and 19. No. 20. Twenty-one thousand two hundred acres. 21. None.

1. *Mono.* 2. None. 3. Manure. 4. No by-law. 5. Spring water used. 6 and 7. No. 8. To hogs. 9. Barn-yard manure heap. 10. None. 11. Spring water. 12, 13, 14, 15, 16, 17, 18 and 19. No. 20. Very little. 21. None.

ELGIN.

Number of municipalities in County, 12. Number returning answers to questions, 5.

1. *St. Thomas City.* 2. No. 3. Carted to country. 4. Yes. 5. Some too close. 6 and 7. No. 8. Thrown out at back door. 9. Carted away by farmers. 10. None. 11. Wells. 12, 13, 14, 15, 16, 17, 19, and 20. No. 21. None.

1. *Aylmer Village.* 2. Committee of Council, M. D. on it. 3. Thrown in creek. 4. No. 7. Yes. 8. Into drains. 11. Wells. 13 and 14. No. 15. Yes. 16 and 17. No. 18. All. 19 and 20. No.

1. *Port Stanley.* 2. Yes. 3. Pits. 4. No by-law. 5. From a few to 100 feet or more. 6. Typhoid traced to them. 7. No. 8. Thrown in back yards. 9. Burned or put in gardens. 10. None. 11. Wells. 12. Some affected. 13, 14, and 15. Yes. 16. *b* one hundred, *c* three, *d* one, *e* five, *f* two. 17. Very little precaution. 18. One-third. 19. No. 20. *a* four or five acres, *b* one. 21. One slaughter house.

1. *Dorchester, South.* 2. No. 3. Put out with other manure. 4. None. 5. Various distances. 6. None. 7. Very few. 8. Some by drain and some on land. 10. No. 11.

Wells. 12, 13, 14 and 15. No. 16. *d* and *f* a few. 17. No. 18. A little. 19 and 20. No. 21. None.

1. *Southwold.* 2. None. 3. None in particular. 4. No by-law. 5. 30 to 60 feet. 6 and 7. No. 8. On the surface. 9. Burned. 10. Yes. 11. Wells. 12. In some cases injurious. 13. None. 14 and 15. Yes. 16. *c* epidemic, *e* some, *f* large number. 17. No. 18. Very great. 19. None. 20. No. 21. Two in Fingal village.

ESSEX.

Number of municipalities in County, 19. Number returning answers to questions, 8.

1. *Henderson Village.* 2. No. 3. Pits. 4. No. 5. Some only 10 feet. 6. Yes. 7. No. 8. Thrown on ground. 9. Thrown on ground. 10. Yes. 11. Surface water. 12. Washed in by rains. 13. No. 14. Yes. 15. Yes. 16. *a* two, *c* ten, *d* ten *e* twenty-eight, *f* forty-five. 17. None. 18. One-half at least. 19. No. 20. *a* four hundred acres, *b* four hundred acres, *c* one hundred acres. 21. Yes, plenty of them.

1. *Anderdon.* 2. No. 3. Manure on farm in spring. 4. None. 5. 30 or 40 rods. 6. None. 7. None. 8. Hogs and sewers. 9. In hog styes. 10. None. 11. Wells. 12. Not much. 13. No. 14. When land is low. 15. None. 16. *a* one, *f* one. 17. None. 18. Very few. 19. None. 20. *a* Four hundred acres. 21. No.

1. *Colchester, North.* 2. Yes, *b* yes, M. D. on Board. 3. Partly pits. 4. None. 5. Some a few feet. 6. Water the source of ill-health. 7. None. 8. When convenient. 9. Usual manner. 10. Yes. 11. Surface water. 12. Bad wells and pits. 13. No. 14. Certainly it is. 15. Village unhealthy. 16. *b* three, *f* one. 17. None. 18. Would not like to say. 19. No. 20. Land all very low. 21. Yes.

1. *Colchester, South.* 2. Yes, in Essex Centre. 3. Hole in ground. 4. No. 5. Some. 6. 50 or 60 feet. 7. Not that I know. 8. Dumped on ground. 9. To hogs and outside. 10. Havn't heard of any. 11. Mostly surface. 12. Must be bad. 13. None. 14. Must be. 15. No. 16. *b* two each, *c* two each, *d* two each, *e* two each, *f* three or four. 17. Doctors do all that is done. 18. Can't say. 19. Not as I know. 20. No 21. No.

1. *Gosfield.* 2. No. 3. Few privies. 4. None. 6. None. 7. None. 8. Thrown anywhere. 9. Thrown anywhere. 10. None. 11. Wells. 12. No. 13. No. 14. No. 15. No. 16. None. 17. None. 19. No. 20. *a* five hundred and eighty-three acres. 21. No.

1. *Rochester.* 2. No. 3. Pits. 4. None. 5. Safe distance. 6. No. 7. None. 8. Throwing near house. 9. Manure heap. 10. None. 11. Wells. 12. No. 13. No. 14. No. 15. North-east of Township, bad—water, ague. 16. *c* few, *d* one, *e* one. 17. None. 18. No. 19. No. 20. *a* two hundred and sixty-four acres. 21. No.

1. *Sandwich, West.* 2. No. 3. Any way. 4. No. 5. Different distances. 8. None. 11. Wells and rivers. 12. No. 13. No. 15. No. 16. *a* two, *c* three, *d* twenty, *e* one hundred, *f* five. 18. Don't know. 19. No. 20. One-tenth. 21. No.

1. *Maidstone.* 2. *b* yes, *c* M. D., no. 3. None. 4. No. 5. None. 6. Diphtheria, yes. 7. No. 8 Not disposed of. 9. Thrown away carelessly. 10. No. 11. Poor surface water and creeks. 13. No. 14. No. 15. Yes. 16. No. 17. None. 18. One-third. 19. No. 20. Much swamp land. 21. No.

FRONTENAC.

Number of municipalities in County, 19. Number returning answers to questions, 8.

1. *Asylum for Insane, Kingston.* 2. No. 3. Into sewer, thence lake. 4. No pits. 5. No wells. 7. One. 8. Same as excreta. 9. To pigs when fit and manure heap. 10. No. 11. Lake Ontario. 12. Not at all. 13. Yes. 15. Yes. 16. *c* four, *f* eighteen. 17. Every precaution.

1. *Hinchinbrooke.* 2. No. 3. Privies. 4. No by-laws. 5. Far from wells. 6. No.

7. No. 8. Thrown on the ground. 9. Burned and put on manure heap. 10. No. 11. Spring and river water. 12. No. 13. No. 14. No. 15. No. 16. *b* twenty, *c* twenty-five. 17. None. 18. None. 19. No. 20. A large quantity. 21. No.

1. *Loughborough.* 2. No. 3. Put on land. 4. No. 5. Can't say. 6. Never heard of any. 7. One. 10. Never heard of any. 11. Wells and springs. 13. Think not. 14. Don't think it. 15. No. 17. None. 19. None. 21. No.

1. *Pittsburgh.* 2. No. 3. No. 7. None that I know of. 15. No. 16. *e* several. 17. None. 21. Yes.

1. *Storrington.* 2. No. 4. None. 7. No. 11. Wells and springs. 13. No. 14. No. 15. No. 16. A number in the winter. 17. None. 18. One-half. 19. No. 20. Some swamp. 21. No.

1. *Wolfe Island.* 2. Yes, *a* outhouses and pig-pens. 3. Burned. 5. 50 feet. 6. No. 7. No. 8. In yard. 9. In yard. 10. No. 11. St. Lawrence river. 12. Badly. 13. Yes. 14. Yes. 15. No. 16. *b* four, *c* one hundred and fifty, *d* two, *e* five, *f* seven. 17. None. 18. Can't say. 19. No. 20. *a* five acres. 21. Yes.

1. *Garden Island.* 2. No. 3. Into river. 4. No pits. 6. No. 7. One or two. 8. Into river St. Lawrence. 9. Into river. 10. No. 11. River St. Lawrence. 12. No. 13. No. 14. No. 15. No. 16 None. 17. None. 18. Very healthy village. 19. No diseases. 20. None. 21. No.

1. *Olden.* No! is the answer to all queries.

GREY.

Number of municipalities in County, 19. Number returning answers to questions, 8.

1. *Meaford Town.* 2. Committee of Council. 3. None. 4. No. 5. Varying distances. 6. Yes. 7. No. 8 and 9. Anywhere. 10. Can't say. 11. Springs. 12. Seriously. 13. Yes. 15. No. 16. *b*, *c*, and *d*, several, *f* some. 17. No. 20. Very little. 21. Yes.

1. *Artemesia.* Answer :—"No health regulations, and consequently no observations upon the subject."

1. *Derby.* 2. No. 3. Pits. 4. No by-laws. 6. None. 7. Yes. 11. Wells and spring creeks. 12, 15, and 16. None. 17. Can't tell. 19. Don't know. 20. One-eighth swamp. 21. No.

1. *Egremont.* 2. None. 3. Put on garden. 4. None. 6. Don't know. 7. No. 8. Fed to hogs. 9. Burned or put on garden. 10. Not any. 11. Springs and wells. 12, 13, and 14. No. 15. Not any. 17. None. 18. Could not say. 19. Not observed. 20. *a* four hundred acres. 21. No.

1. *Euphrasia.* 2. None. 3. Can't say. 4. None. 5. 100 yards. 6. Think not. 7. Can't say. 8. Thrown out and put at trees. 9. Little attention paid to this. 10. No proper precautions. 11. Springs and wells. 12. Very little, I suppose. 13. Not that I know of. 14. Think not. 15. A few cases. 16. *d* a few deaths. 17. Can't tell. 18. Proper precautions are used. 19. Don't attend till well. 20. *a* one thousand acres. 21. None.

1. *Osprey.* 2. None. 3. Privies. 4. None. 5. No particular distance. 6. No. 7. Don't know. 8. Thrown round the corner (?). 9. Same as 8. 10. Not that I know of. 11. Wells. 12. Don't think so. 13. Think not. 15. No. 16. *b* thirty-four deaths, *d* six deaths. 17. None. 18. More than one-half. 19. No. 20. One-eighth marsh. 21. Dead animals.

1. *Proton.* 2. None. 3. Disposed with other manures. 4. At option of inhabitants. 10. No notice taken of diseases. 11. Wells. 12. Water very good. 13 and 14. No. 15. None. 16. No data of cases kept. 17. None. 18. Don't know. 20. No. 19. *a*, *b*, and *c*, thirty-three thousand two hundred and ninety-seven acres. 21. No.

1. *Sullivan.* 2. None 3. Put on the land. 4. No by-law. 5. As far as can be

got. 6. None. 7. A few. 8. On the land. 9. Put on dump heap. 10. None. 11. Springs and wells in limestone. 12. Very little. 13. Very few. 14 and 15. No. 16 and 17. None. 19. Don't think it. 20. *a* twelve hundred acres. 21. No.

HALDIMAND.

Number of municipalities in County, 13. Number returning answers to questions, 5.

1. *Caledonia Village.* 2. No. 3. Common w. c. 4. No. 5. A good distance off. 6 and 7. No. 8. Thrown in back yard. 9. To pigs or in yard. 10. No. 11. Wells. 12. Not affected. 13, 14, and 15. No. 16. *e* six, *f* one. 17. Disinfected. 18. Might have been. 19. Don't think so. 20 and 21. No.

1. *Dunnville Village.* 2. Committee of the Council, *c* no. 3. Pits. 4. Sometimes. 5. Some very close. 7. Some. 8. In yard or sinks. 9. River or dump heap. 10. Cannot say. 11. River and surface wells. 12. Must contain traces of them. 13. River has good current. 14. It must be. 15. Diphtheria. 16. *b* twenty, *d* fifteen. 17. None by Council. 18. All of Diphtheria. 20. Marshes and stagnant water. 21. No.

1. *Dunnville Village,* second reply. 2. Yes, general supervision, three persons on small salaries. 3. Covered with earth. 4. Yes. 5. 60 to 100 feet, and some less. 6 and 7. No. 8. Thrown in privies. 9. Drawn away. 10. No. 11. Wells and cisterns. 12. Some are bad. 13. No. 14. Some. 15. None. 16. *b* twelve. 17. Board of Health looks to it. 18. Can't tell. 19. Yes. 20. None in village. 21. One slaughter-house.

1. *Cayuga, South.* 2. No. 3. On farm. 4. No by-law. 5. 75 to 100 feet. 6. Don't know of any. 7. A few. 8. Thrown on the ground. 9. Burnt. 10. Don't know. 11. Wells and cisterns. 12. Don't know. 13. I think not to any great extent. 14. May be in a few cases. 15. A few. 16. *e* a few. 17. Don't know. 18 and 19. No. 20. Very little of either. 21. Think not.

1. *Dunn.* 2. No. 3. Privies. 4. No. 5. 75 yards. 6 and 7. No. 8. On garden or round trees. 9. Given to pigs. 10. No. 11. River and wells. 12, 13, 14, and 15. No. 16. *d* five, *e* eight. 17. Free from disease. 18. Diseases have stopped. 19. No. 20. *a* three hundred acres. 21. No.

1. *Walpole.* 2. No. 3. Pits. 4. No. 5. All distances. 6 and 7. No. 8. Emptied in back yard. 9. Same as 8. 10. Don't know. 11. Wells. 12. Uninfected probably. 13. No. 14. Not materially. 15. Malaria from swamp water. 16. *f* six, not traced. 17. None. 18. Don't know. 19. No. 20. A small percentage of either. 21. Yes.

HALIBURTON.

Number of municipalities in County, 9. Number returning answers to questions, 2.

1. *Anson and Hindon.* 2. No. 3. Privies. 4. No by-law. 5. Variable. 6. None. 7. No. 8. Thrown out. 9. To stock. 10. None. 11. Rivers, lakes and wells. 12, 13, and 14. No. 15. None. 16. *c* fifty. 19. Yes. 20. *a* ten per cent. 21. No.

1. *Glamorgan.* 2. Township council. 3. Pits. 4. No. 5. Water not affected. 6 and 7. No. 8. Emptied in a few pits. 9. In ashes, etc. 10. No. 11. Wells. 12. Water very soft. 13. Thick necks here. 14. No. 15. None. 16. *c* twelve. 17. No isolation rules. 19. No. 20. *a* two thousand six hundred and forty-six. 21. No.

HALTON.

Number of municipalities in County, 9. Number returning answers to questions, 5.

1. *Milton Town.* 2. No action taken. 3. Can't answer. 4. No. 5. About 20 feet. 6. Can't answer. 7. None. 8. Thrown out. 9. Can't answer. 10. Can't answer. 11. Wells. 12. Can't answer. 13. No. 14. Can't say. 15. None. 16. *b* small number, *c* small, *e* small. 17. None. 18. Can't answer. 19. No. 20. *b* ten acres. 21. Two slaughter-houses.

1. *Oakville Town.* 2. No. 3. Pits. 4. No. 5. 20 to 100 feet. 6. Yes; diph-

theria. 7. Very few. 8. Soakage. 9. Decomposition. 10. Yes. 11. Wells. 12. More or less in each well. 13. Slightly. 14. Yes. 15. Yes. 16. *d* large number, *f* five. 17. None. 18. Nil. 19. No. 20. Yes; marsh not unhealthy. 21. Yes.

1. *Georgetown Village.* 2. No. 3. Pits. 4. No by-laws. 5. Any distance people like. 6. No. 7. No. 8. Drains and yards. 9. Back yards and streets. 10. No. 11. Wells. 12. Not seriously. 13. No. 14. No. 15. No. 16. *b* one hundred, *c* forty, *d* sixty, *e* two, *f* thirty. 17. None. 18. By one-half. 19. Never was asked. 20. *a* five acres, *c* four, three ponds. 21. No.

1. *Acton Village.* 2. No. 3. Pits. 4. No. 5. 30 to 130 feet. 6. None. 7. No. 8. Thrown outside. 9. Burned. 10. None. 11. Wells. 12. No. 13. No. 14. No. 15. No. 16. *b* twelve, *c* one, *d* twenty-seven. 17. No action taken by authorities. 18. Can't say. 19. Yes. 20. *a* 1 acre. 21. No.

1. *Nelson.* 2. No. 3. Barn-yard till May or June. 4. No by-law. 5. From 10 to 50 yards. 6. Can't say. 7. No. 8. Thrown out. 9. Burnt. 10. Can't say. 11. Wells. 12. Can't say. 13. Not much. 14. It may be. 15. No. 16. *e* fifteen or twenty. 17. None; people's option. 18. 50 per cent. 19. Yes. 20. *a* very little, *b* very little, *c* very little. 21. Too many.

HASTINGS.

Number of municipalities in County, 20. Number returning answers to questions, 6.

1. *Belleville City.* 2. Yes. 3. Removed to safe distances. 4. Yes. 5. Too near wells in many cases. 6. Not lately. 7. Yes. 8. Thrown out. 9. Thrown out and removed. 10. No. 11. Wells and springs. 12. Not any. 13. No. 14. Privy pits too near water. 15. No. 16. *b* a few, *d* a few. 17. None. 18. Can't say. 19. Don't go till quite well. 20. No. 21. No nuisances.

1. *Belleville City No. 2.* 2. Yes, but it has accomplished very little. 3. Carted away. 4. No. 5. At all distances. 6. No. 7. Very few. 8. Thrown out back door. 9. According to taste. 10. No. 11. Springs and wells. 12. No. 13. I think so. 14. I think so. 15. No. 16. *b* eight, *c* several, *f* twenty. 17. No attention paid to matter. 18. Difficult to say. 19. No. 21. Yes.

1. *Stirling Village.* 2. No. 3. Pits. 4. No. 5. 30 feet or more. 6. Never proved. 7. No. 8. Thrown out. 9. Thrown in garden, on streets, or over fence. 10. Never proved. 11. Good wells. 12. Privies near creek. 13. No. 14. Yes. 15. No. 16. *c* twenty-five, *e* ten, *f* three or five. 17. None. 18. Can't say. 19. No. 20. None. 21. No.

1. *Carlow and Mayo.* 2. No. 11. Wells and springs. 13. No. 14. No. 15. None. 16. *c* two. 17. None. 21. No.

1. *Dungannon and Faraday.* 2. No. 4. No. 6. No. 7. No. 10. No. 11. Wells. 13. No. 14. No. 15. No. 16. Not one case. 17. None. 19. No. 21. No.

1. *Elzevir.* 2. No. 3. Put on land. 4. No by-law. 5. At safe distance. 6. No. 7. No. 8. Very carelessly thrown. 9. On dump heap. 10. None. 11. Wells. 13. No. 14. No. 15. No. 16. *e* is epidemic. 17. None. 19. No. 20. None. 21. No.

1. *Tyendinaga.* "As there is nothing like a board of health established here, I cannot answer any of the questions in a satisfactory manner."

HURON.

Number of municipalities in County, 25. Number returning answers to questions, 10.

1. *Ashfield.* 2. No. 3. Pits. 4. No. 5. 100 feet. 6. No. 7. No. 8. Thrown into pits and manure heap. 9. Same as 8. 10. None. 11. Wells. 12. Not to any extent. 13. No. 14. No. 15. No. 16. None. 17. None. 19. No. 20. *b* three hundred and fourteen acres. 21. No.

1. *Colborne.* 2. No. 3. Pits. 4. No. 5. 150 feet. 6. No. 7. No. 8. Thrown on the ground. 9. Thrown on the ground. 10. No. 11. Wells. 12. No. 13. No. 14. No. 15. No. 16. *d* eight. 17. None. 19. No. 20. *a* five hundred acres. 21. No.

1. *Goderich Township.* 2. No. 3. Taken into fields. 4. No. 5. Some far, some close. 6. Cause and effect not studied. 7. None. 8. Thrown out. 9. Given to pigs. 10. None. 11. Wells. 12. Water pretty pure. 13. No. 14. No. 15. None. 16. *f* a few. 17. None. 18. Might be. 19. No. 20. Some pools. 21. No.

1. *Grey.* 2. No. 4. No by-law. 5. 50 or 100 feet. 6. No. 7. None. 8. Put on the land. 9. Burned up mostly. 10. None. 11. Good wells. 12. No. 13. No. 14. No. 15. None. 16. *d* three. 17. None. 19. Yes. 20. Thirteen thousand four hundred and forty-four acres. 21. None.

1. *Stephen.* 2. No. 16. *d* sixteen, *e* eight, *f* eight. 19. No. 20. *a* fifteen thousand acres, *b* nineteen thousand acres. 21. No.

1. *Seaforth Village.* 2. Yes. 3. Takes care of itself. 4. Yes. 5. Some 10 feet. 6. Yes. 7. No. 8. Thrown out. 9. Fed to cows and pigs. 11. Wells. 12. Am afraid very much. 13. No. 14. It must be. 15. Diarrhœa. 16. *b* a few, *c* large, *d* a few. 17. None. 18. Can't say. 19. No. 20. Very little. 21. 110 slaughter-houses.

1. *Brussels Village.* 2. No. 3. Pits. 4. No. 5. No attention paid to distances. 6. Think it likely. 7. None. 8. Where people like. 9. Moved every spring. 10. No. 11. Wells. 12. It may be so. 13. No. 14. It must be so. 15. Could not prove it. 16. *d* twenty, *f* six. 17. None. 18. A good many. 19. Yes. 20. *b* several acres. 21. No.

1. *Wroxeter Village.* 2. No. 3. Pits. 4. Not enforced. 5. 20 to 100 feet. 6. Yes. 7. No. 8. Thrown into yard. 9. Upon the ground. 10. No. 11. Wells. 12. Yes. 13. No. 14. In a few cases. 15. Yes. 16. *c* twenty-three, *f* eleven. 17. None. 18. Seventy-five per cent. 19. No. 20. *a* one-fifteenth, *b* one-tenth, *c* one-thirtieth. 21. No.

1. *Exeter Village.* 2. No. 3. Pits. 4. No. 5. Yes. 6. No. 7. No. 8. Fed to hogs. 9. Garden manure. 10. No. 11. Spring wells. 12. No. 13. No. 14. No. 15. No. 16. *a* one. 17. Quarantine. 19. No. 20. None. 21. No.

1. *Bayfield Village.* 2. No. 3. Pits. 4. No. 5. Not known. 6. Don't know. 7. Not known. 8. Not known. 9. Not known. 10. No. 11. Wells. 12. Not known. 13. No. 14. No. 15. None. 16. *c* six, *e* twelve. 17. No precautions. 18. Don't know. 19. No. 20. *a* mill pond. 21. No.

KENT.

Number of municipalities in County, 17. Number returning answers to questions, 7.

1. *Chatham Town.* 2. Yes, *c* two M.D.'s. 3. Carted outside limits. 4. No by-law. 5. From 10 feet upwards. 6. Yes. 7. Not any. 8. Thrown on surface. 9. Manure heaps. 10. No. 11. Wells. 12. It must be so. 13. No. 14. Yes. 15. Have not traced any. 16. *b* eight, *c* forty, *d* six, *e* twelve, *f* fifteen. 17. None. 18. Precautions were taken by M.D. 19. No. 20. None. 21. No.

1. *Wallaceburg Village.* 2. Village Council and Committee. 3. Pits. 4. Yes. 5. From 50 to 130 feet. 6 and 7. No. 8. On ground and in sewers. 9. Burned or on manure heap. 10. No. 11. Wells and river. 12. It must be, some. 13. No more than surface water would be. 14. Not certain. 15. No. 16. *c* two or three, *d* five or six. 17. None. 18. Not any. 19. Think not. 20. None in village. 21. No.

1. *Dresden Village.* 2. Yes, cleanliness of privies, drainage, etc. 3. Burying in earth. 4. Yes. 5. No limited distance. 6. No. 7. A few. 8. By drains. 9. Manure heaps. 10. No. 11. Wells. 12, 13, 14, and 15. No. 16. None. 17. Occasionally. 19. Yes. 20. *a* ten acres drained. 21. None.

1. *Bothwell Village.* 2 and 4. No. 5. 50 to 100 feet. 6. None. 7. No. 10. None. 11. Artesian wells. 12. Not at all. 13 and 14. No. 15, 16, and 20. None. 21. No.

1. *Raleigh.* 2. No. 3. Pits. 4. No. 5. Various distances. 6 and 7. No. 8. Thrown out of doors. 9. Kept to rot. 10. None. 11. Surface water. 12. Little if any. 13. No. 14. Not particularly. 15. No. 16. *c*, *d*, and *e* a few. 17. None. 18. Can't say. 19. No. 20. *a* and *b* three thousand acres.

1. *Tilbury, East.* 2. No. 3. Pits. 4. No. 5. Generally 200 or 300 feet. 6 and 7. No. 8. On the soil, very carelessly. 9. Dunghill or privy. 10. No. 11. Surface wells. 12. Must be affected when too near them. 13. No. 14. In some cases no doubt. 15. No. 16. *b* one family, *c* two or three families, *e* one case. 17. No system. 19. No attention given to "*c*," "*e*," and "*f*." 20. Say seven thousand acres. 21. No.

1. *Zone.* 2. No. 3. On surface at a distance. 4. No by-law. 5. 70 to 100 feet. 6 and 7. No. 8. On surface and in swill barrels. 9. Burn and dig in. 10. No. 11. Wells. 12. If too close to wells bad. 13. No. 14. Yes. 15. one typhoid. 16 and 17. None. 19. No. 20. *c* a little. 21. No.

LAMBTON.

Number of municipalities in County, 20. Number returning answers to questions, 7.

1. *Sarnia Town.* 2. Yes. 3. Pits. 4. No. 5. 30 or 40 feet. 6. No. 7. No. 8. Pits or ground. 9. Buried. 10. Think not. 11. Water tanks. 12. Some, no doubt. 13. No. 14. Probably. 15. Yes. 16. *b* two or three, *c* seven hundred, *e* two or three. 17. None. 18. Considerable. 19. Yes. 20. None. 21. None.

1. *Oil Springs Village.* 2. None. 3. Pits. 4. No by-law. 5. All isolated. 6. None. 7. No. 8. On surface or in drains. 9. Drains or privies. 10. None. 11. Wells. 12. None. 13. No. 14. No. 15. None. 16. None. 17. Needs none. 19. No. 20. None. 21. No.

1. *Wyoming Village.* 2. No. 3. Pits. 4. No. 5. 40 feet to all other distances. 6. No. 7. Don't know of any. 8. Back yards or drains 9. Let rot. 10. Typhoid fever. 11. Wells. 12. Contaminated in some cases. 13. No. 14. Don't know. 15. Typhoid fever. 16. *d* thirty, *f* seven. 17. None. 18. Don't know. 19. Not the rule. 20. *a* one-third, *c* considerable. 21. No.

1. *Thedford Village.* 2. In contemplation. 7. Yes. 11. Wells. 13. No. 14. No doubt it is in many cases. 15. Don't know. 17. None. 19. Don't know. 21. Yes.

1. *Euphemia.* 2. No, but will try and have one. 3. Pits. 4. No. 5. No definite distance. 6. A few, I believe 7. No. 8. Thrown on ground. 9. Thrown out, or to pigs. 10. None. 11. Wells. 12. Can't tell. 13. Think not. 14. It may be so. 15. A few, I believe. 16. *b* eleven, *c* few, *e* thirty, *f* few. 17. None. 18. Yes, by isolation. 19. No. 20. Little or none. 21. Yes.

1. *Moore.* 2. No. 3. No attention given matter. 4. No. 5. From 40 feet upwards. 6. No. 7. No. 8. Near the kitchen door. 9. Strictly let alone. 10. No. 11. Wells. 12. No. 13. No. 14. No. 15. No. 17. None. 18. Can't say. 19. Don't think so. 20. *a* Only few acres. 21. No.

1. *Sarnia Township.* 2. No. 3. Pits. 4. No. 5. Various distances. 6. No. 7. No. 8. Carried off by drain. 9. Barnyard. 10. Don't know of any. 11. Wells. 12. Not to any extent. 13. Not to any extent. 14. No. 15. Not to my knowledge. 16. *c* Several. 17. None. 18. Can't say. 19. Yes. 20. *a* Considerable, and stagnant water. 21. None.

LANARK.

Number of municipalities in County, 17. Number returning answers to questions, 2.

1. *Smith's Falls Village.* 2. No. 3. Pits. 4. No. 5. 100 feet or more 6. None. 7. No. 8. In privies or on ground. 9. Same way as slops. 10. No. 11. Public wells.

12. No. 13. No. 14. No. 15. No. 16. None. 17. No public precautions. 18. Could not be reduced. 19. No. 20. *a* Considerable, near town. 21. 2 slaughter houses.

1. *Sherbrooke, South.* 2. No. 3. Pits. 4. No. 5. About 100 feet, more or less 6. No. 7. None. 8. To hogs, generally. 9. Manure pile. 10. None. 11. Wells. 12. None. 13. No. 14. No. 15. None. 16. None. 17. None. 19. No. 20. None. 21. No.

LEEDS AND GRENVILLE.

Number of municipalities in Counties, 23. Number returning answers to questions, 3.

1. *Crosby, North.* 2. No. 3. None. 4. None. 6. No. 7. No. 8. Thrown out. 9. Don't know. 10. No. 11. Wells and springs. 12. No. 13. No. 14. Think not. 15. No. 16. *b* eight, *c* four. 17. None. 18. None. 19. Think not. 20. Very little. 21. Think not.

1. *Elmsley, South.* 2. No. 3. No special plan I know of. 4. No by-law. 5. Wherever they exist 200 feet away. 6. None. 7. None. 8. Thrown out. 9. Thrown out carelessly. 10. None. 11. Wells. 12. Have not heard of such. 13. Not to any extent. 14. No complaint. 15. Have not heard. 16. *d* eight. 17. No precautions. 18. Don't know. 19. No. 20. Good deal of swamp and stagnant water. 21. No.

1. *Gower, South.* 2. None. 3. Can't say. 4. Pits, but no by-law. 5. Can't say. 6. Can't say. 7. Can't say. 8. Can't say. 9. Can't say. 10. Have not observed any. 11. Wells. 12. Can't say. 13. Think not. 14. Can't say. 15. No. 16. None. 17. None. 18. No extent. 19. Not that I am aware of. 20. *a* eight hundred and thirty-seven acres. 21. Think not.

LENNOX AND ADDINGTON.

Number of municipalities in Counties, 13. Number returning answers to questions, 5.

1. *Napanee Town.* 2. Yes, *b* Inspector. 3. Removed or securely deposited. 4. None. 6. Can't tell. 7. No. 8. Into sewers. 9. Carted away. 10. No. 11. Wells, cisterns and river. 12. Yes. 13. No. 14. Drained into river. 15. No. 16. *c* a few. 17. None. 19. No. 20. A few acres of marsh. 21. No.

1. *Amherst Island.* 2. No. 3. Pits. 4, 5, 6, 7. No. 8. Thrown around. 9. Thrown around. 10. No. 11. Lake water. 12, 13, 14, 15. No. 16. Can't say. 17. None. 18. Can't say. 20. *a* one thousand acres. 21. No.

1. *Camden East.* 2. No. 4. No by-law. 16. *c* Great number, *f* few. 17. None. 19, 21. No.

1. *Denbigh, Abinger and Ashley.* 2. None. 3. Thrown out to rot. 4. No by-law. 5. 60 or 70 feet. 6. None that I know of. 7. Think not. 8. Corner of back yard. 9. Throw in some corner. 10. None. 11. Wells and springs. 12. Not at all. 13. No. 14. Think so. 15. No. 16, 17. None. 18. Very much. 19. Isolated. 20. Not much. 20. No.

1. *Fredericksburg, South.* 2. None. This is all the information given.

LINCOLN.

Number of municipalities in County, 13. Number returning answers to questions, 4.

1. *Town of Niagara.* 2, None. 3. Disgusting, careless method. 4. No. 5. Shockingly near. 6. Yes, decidedly so. 7. 3 or 4. 8. Carelessly thrown out. 9. Not properly attended to on the whole. 10. Yes. 11. Wells and springs. 12. Greatly. 13. 1 or 2 cases. 14. Yes. 15. Yes, several. 16. *b* three, *c* five, *d* seven, *f* two. 17. Very little. 18. No attention given the matter. 19. No. 20. No. 21. Yes, decide dly so.

1. *Grimsby Village.* 2. No. 3. Pits. 4. No. 5. From 20 feet. 6. Don't remember any. 7. A few. 8. Underground tanks. 9. Manure heap. 10. Yes. 11. Wells and springs. 12. Pretty free. 13. No. 14. In some instances. 15. Not

directly traced. 16. *b* ten, *c* twenty-two, *d* three, *e* six. 17. Ordinary means. 19. Not carried out. 20. Considerable. 21. Yes.

1. *Beamsville Village.* 2. None. 3. Pits. 4. None. 5. Various. 6. None. 7. Yes. 8. Thrown out of door or window. 9. Manure heap. 10. None. 11. Wells. 12. No. 13. No. 14. No. 15. None. 16. None. 17. None. 19. No. 20. None. 21. Yes.

1. *Grimsby Township.* 2. No. 3. Pits. 4. No. 5. 40 to 100 feet. 6. Don't know. 7. Can't say. 8. In privies. 9. Manure heap. 10. Don't know. 11. Wells and springs. 12. No complaints. 13. No. 14. It might be. 15. Yes. 16. *c* two or three, *d* eleven, *e* six or seven. 17. Don't know. 18. Unavoidable. 19. No. 20. Very little. 21. One.

MIDDLESEX.

Number of municipalities in County, 25. Number returning answers to questions, 6.

1. *City of London.* 2. Yes. 3. Privy pits. 4. No. 5. From 10 feet up. 6. Yes. 7. Not that I know of. 8. Thrown in yards. 9. Carted away. 10. Yes. 11. Water-works and wells. 12. Wells affected. 13. No. 14. Well water. 15. Not lately. 16. *b* thirty-two, *c* thirteen, *d* twenty-seven, *e* fifteen, *f* twenty-seven. 17. Usual precautions. 18. 50 per cent. 19. Not carried out. 20. None. 21. Don't know.

1. *Town of Strathroy.* 2. Town Council. 3. Pits. 4. Not regularly. 5. From 25 feet. 6. Very few for ten years past. 7. None that I know of. 8. Usually thrown on surface. 9. Any convenient place. 10. Yes, I think so. 11. Wells. 12. Not much. 13. No. 14. Not much. 15. Some suspected. 16. *b* seven, *c* eight, *d* fifty-five, *f* one. 17. Nothing whatever. 18. Not at all this year. 19. Yes, not carried out. 20. Swamps, none. 21. No.

1. *Glencoe Village.* 2. No. 3. Drawn away. 7. No. 8. Sewers. 9. Grass and weeds kept cut down. 10. No. 11. Wells. 12. No complaints. 13. No. 14. No. 15. No. 16. *f* one. 17. None. 18. None. 19. Yes. 20. None. 21. No.

1. *Ailsa Craig Village.* 2. No. 3. Pits. 4. No. 5. 10 to 200 feet. 6. No. 7. No. 8. Thrown out in back yards. 9. Thrown out—often stinks. 10. 9 out of 10 cases hastened by it. 11. Wells. 12. Would you like samples of our well water? 13. No. 14. Get samples and test them. 15. See answer to number 10. 16. *b* one, *f* several. 17. None. 18. Altogether. 19. No. 20. No. 21. No.

1. *Metcalfe.* 2. None. 3. None. 4. No. 5. Can't say. 6. Think not. 7. Not aware of any. 8. Can't state. 9. Don't know, probably burned. 10. None. 11. Wells. 12. Can't state correctly. 13. No. 14. Not that I know of. 15. None. 16. None. 17. No precautions taken. 18. No disease prevalent here. 19. No. 20. No. 21. Yes.

1. *Westminster.* 2 M.D. appointed, Yes. 3. Pits. 4. No. 5. Much to near. 6. Not known. 7. Not that I know of. 8. No system. 9. No system. 10. Not known. 11. Wells. 12 Very little. 13. No. 14. Likely in some cases. 15. No. 16. *f* four. 17. None. 19. No. 20. Very little. 21. No.

MUSKOKA AND PARRY SOUND.

Number of municipalities in Districts, 24. Number returning answers to questions, 12.

1. *Bracebridge Village.* 2. Yes. 3. Buried. 4. No. 5. All distances. 6. Think not. 7. A few. 8 and 9. Thrown out. 10. No. 11. Wells and river. 12. Not beneficially. 13. No. 14. Must be some. 15. No. 16. *b* ten, *c* fifty, *d* two, *e* four, *f* two. 17. None. 18. Materially. 19. No. 20. *b* small quantity. 21. No.

1. *Gravenhurst Village.* 2. No. 3. Pits. 4. No. 5. Various. 6. Not directly. 7. No. 8 and 9. Thrown on gardens. 10. Yes. 11. Wells. 12. Not directly. 13

No. 14. Slightly in some cases. 15. None. 16. *b* eighty, *c* eighty, *e* sixty, *f* five. 18. 40 per cent. 19. No. 20. None. 21. No.

1. *Parry Sound Village.* 2. No. 3. Privy. 4. No. 5. Convenience only regarded. 6. Not directly. 7. No. 8. Thrown out. 9. Sometimes burned in spring. 11. Wells. 12. Can't say. 13, 14, and 15. No. 16. *b* several, *c* large, *e* a few. 17. None. 19. No. 20. *a*, *b*, five thousand acres. 21. No.

1. *Chapman Village.* 2. None. 3. Pits. 4. None. 5. Dangerous proximity. 6. No doctor. 7. None. 8 and 9. Thrown out any place. 10. Not as yet, I believe. 11. Wells and springs. 12. Highly injurious. 13. No. 14. Only in village. 15. No. 16. *d* four, *e* five, *f* one. 17 and 19. None. 20. *a* 10 per cent. 21. No.

1. *Draper and Oakley.* 2. No. 3. Pits. 4. No. 5. 50 to 100 feet. 6. Havn't heard of any. 7. No. 8. Thrown out. 9. Mostly burnt. 10. No. 11. A few wells. 12. Don't know of any bad effects. 13 and 15. No. 16. *e* forty. 17. Not any. 18. One-tenth. 20. *a* 12 per cent 21. No.

1. *McLean, Ridout, &c.* 2. No. 3. Privies. 4. No. 8 and 9. Thrown out. 10. None. 11. The river. 12. Scarcely any. 13, 14, and 15. No. 16. *c* fifteen. 17. None. 18. No special method. 19. No. 20. None. 21. No.

1. *Medora and Wood.* 2. No. 3. Privies. 4. No. 5. Great distance. 6 and 7. No. 8. Thrown on land. 9. Thrown on manure heap. 10. No. 11. Lakes and wells. 12. Not at all as yet. 13. Not yet. 14. Don't know. 15. No. 21. No, very healthy, few deaths.

1. *Ryde.* 2. No. 3. At fence corners. 6 and 7. No. 8. thrown out. 9. Given to hogs. 10. No. 11. Wells. 12. Not at all. 13, 14, and 15. No. 16. *b* two. 17 and 18. None. 19. No. 20. *a* two thousand eight hundred and seventy-five acres. 21. No.

1. *Stisted.* 2. No. 3. Pits. 4. No. 6 and 7. No. 9. Buried. 10. No. 11. Good springs. 12. Don't know of any. 13, 14, and 15. No. 17. No precaution. 19. Don't think so. 20. *a* one thousand nine hundred and sixty-five acres. 21. No.

1. *McDougall.* 2. None. 3. No method. 4. No. 5. 10 to 100 feet. 6. None. 7. No. 8. Thrown out carelessly. 9. Burnt usually. 10. None. 11. Wells. 12. Don't know. 13. Not to any extent. 14. No. 15. None. 18. Can't give an idea. 19. No. 20. *a* one hundred acres. 21. Yes, 2, slaughter house, etc.

1. *McKellar.* He says :—"Answers would be a farce."

1. *Armour.* 2. No. 16. *c* one family.

NORFOLK.

Number of municipalities in County, 11. Number returning answers to questions, 5.

1. *Port Dover Village.* 2. No. 3. Pits. 4. No. 5. From 40 feet. 6. Don't know. 7. No. 8. Thrown out. 9. Yard or street. 10. Don't know. 11. Wells. 12. Not much. 13. No. 14. May be. 15. Can't trace any. 16. *b* four, *c* one, *d* four, *e* four, *f* six. 17. None only what Dr. orders. 18. One-half. 19. No. 20. *a* twenty acres. 21. No.

1. *Charlotteville South.* 2. No. 3. Pits. 4. No. 5. 20 to 50 or 100 feet. 6. Yes. 7. None. 8. Thrown out. 9. Fed to pigs. 10. Unable to say. 11. Springs and wells. 12. Limited extent. 13. Yes. 14. Limited extent. 15. Yes. 16. *b* twenty, *c* thirty, *d* seventeen, *e* fifteen. 17. None. 18. Can't say. 19. No. 20. *a* twenty per cent. 21. No.

1. *Houghton.* 2. No. 3. Pits. 4. No. 5. 80 to 100 feet. 6 and 7. None. 8. Thrown on soil. 9. On soil and manure heap. 10. No. 11. Wells. 12. Unaffected. 13, 14, and 15. No. 16. *e* few. 20. *a* two hundred and twenty acres. 21. None.

1. *Walsingham.* 2. No. 3. Pits. 4. No. 5. 50 to 200 feet. 6. None. 7. Very few. 8. Thrown out. 9. Burned up. 10. None. 11. Springs and wells. 12. It must

be. 13. Think not. 14. It may. 15. No. 16. *e* two hundred. 17. None. 18. Hard to say. 19. No. 20. *b* ten thousand acres of marsh. 21. Yes.

1. *Charlotteville North.* 2. No. 3. Pits. 4. No. 5. 60 feet. 6 and 7. No. 8 and 9. Thrown out. 10. Don't know. 11. Wells. 12. Don't know. 13. No. 14. Don't know. 15. No. 16. *b* six, *d* six. 17. None. 18. Don't know. 19. No. 20. *a* a few hundred acres. 21. No.

NORTHUMBERLAND AND DURHAM.

Number of municipalities in Counties, 24. Number returning answers to questions, 3.

1. *Bowmanville Town.* 2. Yes. 3. Pits. 4. Yes. 5. 30 feet. 6. Don't know. 7. A few. 8. No general rule. 9. No general rule. 10. Don't know. 11. Wells. 12. Can't say. 13. No. 14. Probably. 15. No. 16. *f* two. 19. No. 21. Yes.

1. *Alnwick.* 2. No. 3. No past method. 4. No by-law. 5. Can't tell. 6. No. 7. No. 8. Thrown out. 9. Burned. 10. No. 11. Wells and springs. 12. Not at all. 13. No. 14. No. 15. No. 16. *b* thirty, *c* fifteen, *d* twenty. 17. No precaution. 18. Don't know. 19. No. 20. *a* one thousand five hundred acres, *b* two hundred and fifty acres. 21. No.

1. *Cartwright.* 2. No. 3. Pits. 4. No. 5. Too near. 6. Yes, diphtheria. 7. No. 8. Thrown out. 9. No organized method observed. 10. Think not. 11. Wells. 13. No. 14. I think so. 15. No. 16. *c* two, *d* seven. 17. No. 18. Very materially. 19. No. 20. *a* four thousand three hundred acres, *b* three thousand five hundred acres. 21. No.

ONTARIO.

Number of municipalities in County, 16. Number returning answers to questions, 6.

1. *Pickering.* 2. No. 3. Water-closets. 4. None. 5. No particular distance. 6. Can't say. 11. Wells. 16. *a* one. 17. Isolated.

1. *Rama.* 2. None. 3. None. 4. No. 5. Could not say. 6. No. 7. No. 8. Could not say. 9. Burned. 10. No. 11. Wells. 12. Never heard of any. 13. No. 14. No. 15. No. 17. None. 18. Could not say. 19. Never heard of any. 20. *c* one-third of an acre. 21. No.

1. *Reach.* 2. No. 3. The same as all country places. 4. No. 5. Can't say. 6. Not that I know. 7. No. 8. Fed to hogs. 9. Fed to hogs. 10. Don't know. 11. Wells. 12. Think not. 13. No. 14. No. 15. No. 16. Kept no record. 17. None. 18. Can't say. 19. Think not. 20. *a* eight thousand and eighty acres. 21. No.

1. *Scott.* 2. No. 3. No particular way. 4. No. 5. Distance not observed. 6. None reported. 8. No. 8. Thrown out. 9. Given to pigs. 10. None. 11. Wells. 12. None. 13. No. 14. No. 15. No. 16. No. 17. No precaution. 19. No. 21. No.

1. *Scugog.* 2. No. 3. Pits. 4. No. 5. At safe distance. 6. Not that I know of. 7. No. 8. Thrown out. 9. Fed to stock. 10. Not that I know. 11. Wells. 12. Not affected. 13. No. 14. Not that I know. 15. No. 16. *c* large, *f* four. 19. No. 20. Some swamp, *b* large. 21. No.

1. *Cannington.* 2. No. 3. Pits. 4. No. 5. Fifty to 100 feet. 6. No. 7. One or two. 8. Put on ground. 9. Burned when dry. 10. No. 11. Wells. 12. Not affected. 13. No. 14. No. 15. No. 16. *d* eleven, *f* six. 17. Being seen to. 18. Can't say. 19. No. 21. No.

OXFORD.

Number of municipalities in County, 16. Number returning answers to questions, 7.

1. *Ingersoll Town.* 2. No. 3. Thrown any place. 4. No. 5. Ten to 200 feet. 6. No. 7. A few. 8. Thrown in cess-pools. 9. Don't know. 10. No. 11. Wells and springs. 12, 13, and 14. No analysis made. 15. No. 16. No record. 17. Very ordinary. 18. Can't state. 19. No. 20. *b* five ponds. 21. No complaint.

1. *Woodstock Town.* 2. Yes. 3. Pits. 4. No. 5. A few feet upwards. 6. Suspected. 7. A few. 8. Yards, soil or back lanes. 9. Same as number 8. 10. Don't know of any. 11. Wells. 12. Injuriously in many cases. 13. No. 14. Yes. 15. Suspected several. 16. *b* fifteen, *c* seven, *d* twelve, *e* sixteen, *f* two. 17. No regular method. 18. Can't say. 19. No. 20. *a* thirty acres, *b* five acres. 21. Not to any serious extent.

1. *Blenheim.* 2. No. 3. Pits. 4. No. 5. At all distances. 6. Don't know. 7. No. 8. Thrown out. 9. On lands or manure beds. 10. Don't know. 11. Wells. 12. Bad probably. 13. Very little. 14. It may be. 15. Not certain of cause. 16. *c* few, *d* twenty. 18. Can't say. 19. No. 20. *a* eight thousand acres, *b* six hundred acres, *c* three hundred acres.

1. *Dereham.* 2. No. 3. Self-disposed of. 4. No by-law. 5. Some cases at once over wells. 6. Yes. 7. No. 8. No system. 9. Left to rot in the sun. 10. Hard to say. 11. Wells. 12. Very much affected. 13. Some cases. 14, and 15. Yes. 16. *b* thirty, *c* three, *d* fourteen, *f* eleven. 17. None. 18. 10 per cent. 19. No. 20. *a* seven thousand five hundred acres, *b* one thousand two hundred and fifty. 21. Yes.

1. *Nissouri, East.* 2. No. 3. No attention given. 4. No. 5. 15 to 200 feet. 6. No. 7. A few. 8. Thrown out. 9. Fed to pigs, etc. 10. None. 11. Wells. 12. Can't say. 13. No. 14. It may be. 15. No. 16. *b* sixteen, *c* six, *f* two. 17. No present precautions. 18. Can't say. 21. Yes.

1. *Embro Village.* 2. No. 3. Pits. 4. No by-laws. 5. 50 to 100 feet. 6, and 7. None. 8. Thrown in yards. 9. In ponds and burned. 10. None known. 11. Springs and wells. 12. Not seen. 13. No. 14. Think not. 15. Not traceable. 16, and 17. None. 19. Yes. 20, and 21. None.

Woodstock, No. 2. 2. Yes. 3. Pits. 4. Yes. 5. Some too close. 6. Can't say. 7. A few. 8. Cess-pools, etc. 9. Mostly burned. 10. Can't say. 11. Wells. 12. Wells polluted. 13. No. 14. Wells polluted. 15. No. 16. *b*, and *d* some, *e* good deal. 17. No. 18. Considerably. 19. No. 20. Very little. 21. No.

PEEL.

Number of municipalities in County, 8. Number returning answers to questions, 1.

1. *Streetsville Village.* 2. No. 3. Pits. 4. No. 5. Wherever placed. 6. No enquiry made. 7. No. 8. Carelessly thrown out. 9. Manure heaps. 10. Typhoid fever observed. 11. Wells. 12. Undoubtedly. 13. No. 14. Would think so. 15. Not since '81. 16. *b* eight, *d* five, and *f* two. 17. None. 18. Can't say. 19, and 20. None. 21. Can't say.

PERTH.

Number of municipalities in County, 16. Number returning answers to questions, 7.

1. *Listowel Town.* 2. No active board. 3. Creeks and gardens. 4. Use privy pits. 5. 40 to 100 feet. 6. Think not. 7. Not aware of any. 8. Drains and soaking. 9. In the gardens. 10. Think not, 11. Wells. 12. Haven't heard any complaints. 13. Think not. 14. Don't know. 15. No. 16. No record kept. 17. None. 18. Don't know. 19. No. 20. Almost none. 21. No.

1. *St. Marys Town.* 2. No. 3. Pits. 4. No. 5. From 30 feet. 6, 7. No. 8. Throw on ground. 9. Manure heaps. 10. No. 11. Flowing wells, etc. 12. Not at all. 13, 14, 15. No. 16. None. 17. To provide pest houses. 18, 19. No. 20. None. 21. No.

1. *Mitchell Village.* 2. Yes. 3. Pits. 4. No by-law. 5. No limit. 6, 7. No. 8. Thrown any place. 9. Thrown any place. 10. No. 11. Wells. 12. Surface water. 13. No. 14. I believe so. 15. No. 16. *b* twenty-five, *c* one hundred, *d* fifty, *f* twenty. 17. No public precaution. 18. Very largely. 20. None. 21. Clean slaughter-houses.

1. *Easthope, North.* 2. Yes. 3. Water closets. 4. No. 5. Sufficient distance. 6. None. 7. Yes. 8. To hogs. 9. On manure heaps. 10. No. 11. Wells and springs. 12. Not at all affected. 13, 14. No. 15. None. 16. *b* few, *c* yes. 17. None. 19, 20, 21. No.

1. *Easthope, South.* 2. No. 3. As manure. 4. No by-law. 5. 1 to 6 rods. 6. Yes. 7. No. 8. Thrown in yards. 9. Burnt and thrown out. 10. Not lately. 11. Wells. 12. Some polluted. 13. No. 14. More or less. 15. A few cases of diphtheria. 16. *b* twenty, *c* twenty five, *d* six, *e* two, *f* one. 17. Isolation and disinfection. 18. One-half. 19. No. 20. *a* two acres. 21. Yes, one.

1. *Elma.* 2. No. 3. No method. 4. No by-lay. 5. 2 to 4 rods. 6. Not that I am aware of. 7. No. 8. Thrown out. 9. Thrown on manure heaps. 10. None that I know of. 11. Wells. 12. Can't say. 13. No. 14. Think not. 15. No. 16. None. 17. No precaution. 19. No. 20. Swamp, considerable. 21. No.

1. *Wallace.* 2. No. 3. Pits. 4. No. 5. 100 to 300 feet. 6, 7. No. 8. Flows to stable-yard. 9. Thrown on manure piles. 10. No. 11. Springs and wells. 12. Not affected. 13, 14, 15. No. 16. *c* many. 17, 19. No. 20. *a* five thousand nine hundred and eighty-eight acres. 21. No.

PETERBOROUGH.

Number of municipalities in County, 21. Number returning answers to questions, 3.

1. *Peterborough Town.* 2. No. 3. Pits. 4. Not enforced. 5. Various distances. 6. Yes, several. 7. About a dozen. 8. Thrown on the ground. 9. Thrown about the yard. 10. Not exactly traced. 11. W. w. and wells. 12. Many wells are. 13. Don't know. 14, 15. Yes. 16. *a* eight, *b* fifteen, *c* many, *d* three, *e* many, *f* twenty-eight. 17. Imperfect regulations. 18. To a minimum. 19. No. 20. *b* fifty acres, *c* three 21. Yes.

1. *Lakefield Village.* 2. No. 3. Water closets. 4. No. 5. From twenty-five feet. 6. No. 7. Two or three. 8. No proper disposal. 9. Some burnt. 10. No. 11. Wells. 12. Surface water may be. 13. No. 14. Don't know. 15. Not to my knowledge. 16. *b* twenty, *c* thirty-five, *d* twenty-four, *e* four. 17. Nothing specific. 18. Can't say. 19. No. 20. *a* twelve to fifteen acres. 21. No.

1. *Dummer.* 2 and 4. No. 8. Thrown out. 9. Thrown out. 11. Wells. 13. No. 16. *d* ten. Chloride of lime, etc. 18. About 6 cases. 19. No. 20. *a* one-eighth, *b* one-hundredth, *c* one-hundredth. 21. No.

PRESCOTT AND RUSSELL.

Number of municipalities in Counties, 13. Number returning answers to questions, 1.

1. *Alfred.* 2. No. 3. No method. 4. None. 6. None. 7. A few. 8. Spilled on the ground. 9. Used as manure. 10. None. 11. Wells. 12. Not noticed. 13, 15. No. 16. *b* four, *d* ten, *e* one, *f* one, 17. None. 18. Don't know. 19. Yes. 20. Don't know. 21. No.

PRINCE EDWARD.

Number of municipalities in County, 9. Number returning answers to questions, 3.

1. *Picton Town.* 2. Yes. 3. Water Closets. 4. No. 5. 20 to 100 feet. 6. A few. 7. There may be some. 8. Put in some covered pits. 9. Put in marsh near by. 10. Could not say. 11. Wells. 12. To a limited extent. 13. No. 14. Very limited. 15. Very few. 16. *b* three, *c* two, *d* six, *f* two. 17. None. 18. 50 per cent. 19. Yes. 20. Very limited. 21. No.

1. *Athol.* 2. No. 3. None. 4 and 10. No. 11. Springs and Wells. 13, 14, 15. No. 16. *d* ten. 17. None. 18. Don't know. 19. No. 20. *a* five hundred acres, *b* fifty acres, *c* ten acres. 21. No.

1. *Hallowell.* 2. No. 11. Wells and springs. 13, 14, 15. No. 21. Yes.

RENFREW.

Number of municipalities in County, 25. Number returning answers to questions, 8.

1. *Arnprior Village.* 2. No. 3. Into river. 4, 6, and 7. No. 8, and 9. Thrown

in yard. 10. Don't know. 11. Wells. 12. Not affected. 13. No. 14. Not that I know of. 15. No. 17. None. 19. Yes. 20. None. 21. No.

1. *Renfrew Village.* 2. Yes. 3. No particular method. 4. Yes. 5. All distances. 6. No. 7. None. 8, and 9. Thrown in yards, etc. 10. None heard of. 11. Wells. 12. Not any. 13. None. 14. No. 15. None. 16. *d* four. 18. Could not say. 19. Not always. 20. None. 21. No.

1. *Alice.* 2. None. 3. A few privies. 4. None. 6. None that I know of. 7. No. 8. On manure heaps. 9. Manure heaps. 10. Not that I know of. 11. Wells and springs. 12. Not affected. 13, 14, and 15. No. 16. *e* innumerable. 17. Washing and airing. 18. Can't say. 19. No. 20. *a* three per cent. 21. None.

1. *Brougham.* 2. None. 11. Wells and springs. 12. None. 13, 14, and 15. No. 16. *d* six. 19. Yes. 20. Very little. 21. None.

1. *Rolph, Buchanan and Wylie.* 2. No. 3. Fields and pits. 4. No. 5. Very careful. 6, and 7. No. 8. Thrown out. 9. Manure heaps. 10. None. 11. Wells and springs. 12, 13, 14, and 15. No. 16. *e* a few, *f* two. 17. Require none. 18. Good health. 19. Not asked. 20. Good deal of swamp. 21. No.

1. *Sebastopol.* 2. No. 3. Fields or bush. 6, and 7. No. 8, and 9. Pitched away. 10. No. 11. Living springs. 12. Not at all. 13, 14, and 15. No. 16, and 17. None. 19, and 21. No.

1. *Brudenell.* 2. No. 3. Privies. 4, and 6. No. 7. None. 8. Thrown in gardens. 9. Left on dung hill. 10. No. 11. Running streams. 12. Clean only at spring thaw. 13. No. 14. At one or two hotels. 15. None. 16. No cases. 17. None. 19. No. 20. *a* two per cent. 21. No.

1. *Hagarty, etc.* 2. No. 3. No methods employed. 4. None. 8, and 9. Thrown on ground. 10. None. 11. Creeks, lakes, and springs. 12. Not affected. 13, 14, and 16. No. 17. None. 19. No. 20. Hardly any. 21. No.

SIMCOE.

Number of municipalities in County, 24. Number returning answers to questions, 10.

1. *Barrie Town.* 2. No. 3. Usually buried. 4. Pits, no. 5. 40 feet, upwards. 6. Not that I know of. 7. A few. 8. Thrown out very badly. 9. Burned or carted away. 10. Can't learn of any. 11. Artesian and other wells. 12. Not to any extent affected. 13. No. 14. Slightly if at all. 15. No. 16. *d* and *f* few. 17. Use disinfectants. 19. Think not. 20. None of any account. 21. None.

1. *Barrie Town,* second reply. 2, and 3. None. 4, 5, 6, 7, 8, 9, and 10. No. 11. Wells. 12. None. 13, 14, and 15. No. 16, and 17. None. 18, 19. No. 20. *a* ten per cent. 21. None.

1. *Collingwood Town.* 2. None. 3. Buried outside. 4. No by-law. 5. No regular distance. 6. Not that I know of. 7. Some. 8. Thrown out back. 9. Carted away. 10. Not aware of any. 11. Wells. 12. Haven't heard. 13. No. 14. Know of none. 15. None. 16. *b* large, *e* several. 17. Not aware of any. 19, and 20. No. 21. By-law to prevent.

1. *Bradford Village.* 2. Nominal Board. 3. Pits. 4. No by-law. 5. No distance as a rule observed. 6. Not that I know of. 7. One. 8, and 9. Thrown out. 10. Not that I know of. 11. Wells. 12. Water is good. 13. No. 14. Haven't heard. 15. No. 16. *c* five, *d* eleven, *e* eighteen, *f* eighteen. 17. None. 18. Slightly. 19. Not as I know of. 20. *a* forty miles. 21. Yes.

1. *Alliston Village.* 2. No. 3. Pits. 4. No. 5. 30 or 40 feet. 6. Don't know. 7. No. 8. In privies and on ground. 9. Carted away. 10. Don't know. 11. Wells. 12. Wells may be polluted. 13. No. 14. Very likely. 15. Havn't heard of any. 16. *b, d,* and *e.* Few. 17. None. 18. It could be reduced. 19. Don't know. 20. Small pond. 21. No.

1. *Midland Village.* 2. No. 3. Pits. 4. No by-law. 5. Only a few feet in cases.

6. A few cases so far. 7. A few. 8, and 9. Thrown out. 10. Yes. 11. Wells and springs. 12. By living too close. 13. No. 14. Yes. 15. Yes. 16. *b* thirty, *c* twelve, *d* fifteen, *e* five, *f* three. 17. Not allowed to attend if affected. 18. One-quarter. 19. Yes, in some cases. 20. *a* twenty-five acres, *b* nine, *c* five. 21. Privy pits.

1. *Penetanguishene Village.* 2. No. 3. Pits. 4. No by-law. 5. From 100 feet. 6. No. 7. one or two. 8. Thrown on ground. 9. To cattle or pigs. 10. Don't know. 11. Springs. 12. Not to my knowledge. 13, 14, and 15. No. 16. *c* several, *d* one, *f* six or seven. 17. None. 18. Not all. 19. No. 20. *a* seventy-five acres. 21. No.

1. *Cookstown Village.* 2. No. 3. Pits. 4. No. 5. 30 to 100 feet. 6. No. 7. None. 8, and 9. To pigs. 10. In a few cases. 11. Wells. 12. Good water. 13, 14, and 15. No. 16. *b* thirty-nine, *c* seventy-five, *d* twenty, *f* fifteen. 17. No precautions. 19. Yes. 20. None. 21. No.

1. *Adjala.* 2. *a* do-nothing Board. 3. Allowed to remain in the privies. 4. None. 5. From a few feet up. 6. Haven't heard of any. 7. No. 8, and 9. Spilled in the yard. 10. Don't know. 11. Wells. 12. Refuse thrown into creeks. 13. Would say slightly. 15. No. 16. *c* five, *d* nine. 17. None. 18. Can't say. 19. No. 20. *b* one-twentieth. 21. No.

1. *Flos.* 2. No. 3. Thrown anywhere. 4. No by-law. 5. 30 feet, upward. 6. Not certain. 7. No. 8. Thrown from door. 9. Remains anywhere. 10. Not certain. 11. Shallow wells. 12. No doubt in many cases. 13. No. 14. In some instances. 15. Am not aware of any. 16. *b* twenty-four, *d* sixteen, *e* two. 17. No precautions. 18. 30 per cent. 19. No rule. 20. Not to any extent. 21. Yes, two bad ones.

1. *Stayner Village.* 2. No. 3. To enrich gardens. 4. No. 5. No particular distance. 6. Yes. 7. No. 8. Thrown in the yards. 9. Left in the public streets. 10, Not to my knowing. 11. Wells. 12. Causes, typhoid fever. 13. No. 14. Except by water closets. 15. Yes. 16. *b* two hundred, *c* thirty, *d* seventy-five, *f* twelve. 17. None. 18. Don't know. 19. Yes. 20. *c* two acres. 21. Yes.

STORMONT, DUNDAS, AND GLENGARRY.

Number of municipalities in Counties, 15. Number returning answers to questions, 3.

1. *Charlottenburg.* 2. No. 3. Pits. 4. No. 5. Close to wells in many cases. 6. Not aware of any. 7. No. 8. Thrown on the ground. 9. No proper precautions taken. 11. Rivers and wells. 12. Wells must be affected. 13. No. 14. Must be in village. 15. No. 16. *e* eight. 19. Some times. 20. *a* one thousand one hundred and fifty-seven acres. 21. No.

1. *Lochiel.* 2. None. 4. No. 11. Springs and wells. 13 and 15. No. 16. *d* few.

1. *Roxborough.* 2. No. 3. Put on land. 4. No by-law. 5. At a reasonable distance. 6 and 7. No. 8. Thrown in gardens. 9. Spread on land. 10. No. 11. Wells. 12. Not affected. 13, 14, and 15. No. 16. *a* one, *e* two. 17 and 19. No. 20. *a* five thousand acres, *b* five hundred acres. 21. No.

VICTORIA.

Number of municipalities in County, 17. Number returning answers to questions, 4.

1. *Bexley.* 2. Yes. 3. Water-closets. 4. No. 5. From 20 yards. 6. Don't know. 7. No. 8. Thrown out back door. 9. Thrown out in rear. 10. Can't say. 11. Rivers and creeks. 12. Don't know. 13 and 14. Think so. 15. Yes. 16. *d*, *e*, and *f* yes. 17. None. 19. No. 20. Very little. 21. Don't know.

1. *Eldon.* 2. No. 11. Wells. 13, 17, and 19. No. 20. *a* ten thousand acres, *b* and *c* five hundred acres. 21. None.

1. *Laxton, Digby.* 2. No. 11. Springs and wells. 13, 14, 15, and 16. No. 17. None. 20. *a* one-sixth, *b* one-twentieth, *c* one-thirtieth. 21. No.

1. *Omemee Village.* 2. No. 3. Pits. 4. No by-law. 5. 50 to 100 feet. 6 and 7. No

8. Privy and manure heaps. 9. On manure heaps. 10. No. 11. Wells. 12. No injurious effect. 13, 14, and 15. No. 16. *c* yes. 17. None. 19. No. 20. None. 21. Two slaughter-houses.

WATERLOO.

Number of municipalities in County, 11. Number returning answers to questions, 4.

1. *Woolwich.* 2. No. 3. Buried. 5. From 100 feet. 6. None I know of. 7. No. 8. Carried off in drain. 9. On manure pile. 10. No. 11. Wells. 12. Not affected. 13. No. 14. Don't know. 15. No. 16. *d* and *f* few. 17. None. 19. No. 20. None. 21. No.

1. *Berlin Town.* 2. Yes. 3. Pits. 4. Not properly. 5. No regard to health. 6. Think so. 7. A few. 8. Thrown in open drains. 9. Manure heaps. 10. Can't answer. 11. Wells. 12. Soon will be felt here. 13. No. 14. It must be. 15. Can't answer. 16. *b* thirty, *c* and *d* fifty, *f* twelve. 17. None. 18. Half or more. 19. Yes. 20 and 21. No.

1. *Galt Town.* 2. Health officer. 3. Pits. 4. No. 5. 10 to 100 feet. 6. Yes. 7. No. 8. In privies and thrown out. 9. Carted away. 10. No. 11. Wells and springs. 12. By being too close to wells. 13. No. 14. Not as I know of. 15. Yes. 16. *b* six, *c* forty, *d* fifteen, *f* eighteen. 17. None. 18. One-half. 19. Yes. 20. *b* twenty-five acres. *c* one acre. 21. Yes.

1. *Hespeler Village.* 2. No. 3. Pits. 4. Kept clean. 5. 100 to 300 feet. 6 and 7. No. 8. Thrown in drains. 9. Fed or carted away. 10. No. 11. Running springs. 12. Not at all. 13, 14, and 15. No. 16, 17, and 18. None. 19. Yes. 20. None. 21. No.

WELLINGTON.

Number of municipalities in County, 23. Number returning answers to questions, 11.

1. *Erin.* 2. No. 3. Put on fields; manure. 4. No. 5. Not in reach of wells. 6. No. 7. Not that I know of. 8 and 9. Thrown out doors. 10. No. 11. Wells. 12, 13, and 14. No. 15. None. 16. Diphtheria and measles. 17. None needed. 19. Think not. 20. Not much. 21. No.

1. *Garafraxa, West.* 2. None. 3. Water-closet. 4. Pits, no by-law. 5. 20 to 50 yards. 6 and 7. None. 8. Thrown into back yard. 9. On manure heap. 10. None. 11. Wells. 12. Not affected. 13, 14, and 15. No. 16. *b* and *c* twenty-five, *d* nineteen, *e* nine. 17. None. 18. Can't say. 19. No. 20. Scarcely any. 21. No.

1. *Peel.* 2. No. 3. No system. 4. No by-law. 5. Hard to specify. 6. Might be so. 7. No. 8. Some careful, others not. 9. Thrown in barnyard. 10. None that I know of. 11. Wells. 12. Not studied out. 13. No. 14. Not that I know of. 15. No. 16. *c* and *d* several. 17. Hap-hazard system. 18. Could not say. 19. Yes. 20. *a* three thousand one hundred and thirty-eight. 21. No.

1. *Puslinch.* 2. None. 3. Pits. 4. No by-law. 5. Safe distance. 6. None that I know of. 7. Yes. 8. On ground or in the garden. 9. Compost heap. 10. Aware of none. 11. Springs and wells. 12. Not at all. 13 and 14. No. 15. None. 16. *b* and *d* a few, *f* five. 17. Efforts well directed. 18. Isolation. 20. *a* one-fifth. 21. None that we know.

1. *Fergus Village.* 2. No. 3. Pits. 4. No. 5. All distances. 6. Yes. 7. No 8 and 9. Thrown out back door. 10. Not that I known of. 11. Wells. 12. Very injuriously. 13. No. 14 and 15. Yes. 16. *b* twenty, *c* one hundred, *d* twenty-five, *e* ten six. 17. None. 18. One-half. 19. No. 20. None. 21. Yes, a slaughter-house.

1. *Guelph City.* 2. Yes. 3. Put on farms. 4. Yes. 5. From 20 feet upwards. 6. None reported. 7. A few. 8. Thrown in a hole. 9. Carried to nuisance grounds. 10. None. 11. Water-works and springs. 12. None. 13 and 14. No. 15. None. 16. *b* few, *c* large, *d* several, *f* few. 17. Disinfection used. 18. Doubtful. 19. Yes 20. Very few. 21. None.

1. *Mount Forest Town.* 2. Inspector; yes. 3. Burying. 4. Yes. 5. 50 feet 6. Some time ago, two years. 7. Some. 8. All sorts of ways. 9. Carted off. 10. No. 11. Wells. 12. Generally unaffected. 13 and 14. No. 15. Not recently. 16. *b* twenty, *d* twenty-five, *e* twenty, *f* twenty-five. 17. No occasion. 18. Typhoid would go if good drainage. 19. No. 20. Very little. 21. No.

1. *Harriston Village.* 2. Committee of Council. 3. No method. 4. No by-law. 5. No regulation. 6. No. 7. Not known. 8 and 9. No regulation. 10. No. 11. Wells. 12. Not known to be injurious. 13, 14, and 15. No. 16. *d* one death. 17. Investigating. 20. None. 21. No.

1. *Drayton Village.* 2. No. 3. No special method. 4. No. 5. Some only a few feet. 6. Know of none. 7. Think not. 8. Thrown out. 9. Don't know. 10. Know of none. 11. Wells and river. 12. Can scarcely say. 13. Don't know. 14. May be so. 15. Know of none. 16. None. 17. Know of none. 18. Don't know. 19. None. 20. *a* several acres. 21. No.

1. *Palmerstown Town.* 2. Yes. 3. Pits. 4. No. 5. As far as lots will permit. 6 and 7. No. 8. Thrown on surface. 9. Burned or drawn away. 10. No. 11. Wells. 12. Very little. 13. No. 14. Nothing of any consequence. 15. No. 16. *b* six, *d* three, *e* six. 17. None. 18. Entirely prevented. 19. Have not been compelled to do so. 20. *a* fifteen acres. 21. No.

1. *Guelph City No. 2.* 2. Yes. 4. Clearing them. 5. 20 to 100 feet. 6. Yes 7. No. 8. Thrown in the yards. 9. Left to decay, etc. 10. Yes. 11. Water-works and spring water. 12. Cannot be. 13. No. 14. Private wells are. 15. Yes. 16. *b* a few, *c* a number, *d* two, *e* a number. 17. None. 18. Could not say. 19. Law not enforced. 20. Very small. 21. Yes.

WELLAND.

Number of municipalities in County, 14. Number returning answers to questions, 2.

1. *Chippawa Village.* 2. None. 3. Each cleans her own. 4. No. 5. 100 feet. 6 and 7. No. 8. Carried off by drains. 9. Manure piles. 10. No. 11. Wells. 12. Not affected. 13, 14 and 15. No. 16. *b* two. 17. None. 19. Yes. 20. *a* twenty acres. 21. No.

1. *Fort Erie Village.* 2. Yes. 3. Pits. 4. Yes. 5. 50 to 100 feet. 6. None traced. 7. None. 8. Thrown in back yards. 9. Manure heap. 10. None appeared. 11. Niagara water. 12. No. 13. Think not. 14 and 15. No. 16. *c* few, *e* few. 17. None. 19. No. 20. None. 21. No.

WENTWORTH.

Number of municipalities in County, 11. Number returning answers to questions, 7.

1. *Hamilton City.* 2. Yes. 3. Water closets and pits. 4. On complaint, yes. 5. From 50 feet. 6 and 7. Yes. 8. Thrown out. 9. On heap in back yards. 10. Can't say. 11. Water-works. 12. Not at all. 13. There may be cases. 14. No. 15. Only where city water is not used. 16. *b* six, *c* forty-five, *d* two, *f* six. 17. No proper system. 19. Unable to say. 20. A swamp west of city. 21. No.

1. *Hamilton City*, second reply. 2. Yes. 3. Privy vaults. 4. Yes. 5. Often too close. 6. None reported. 7. No. 8. Sewers or cess-pits. 9. Burned, etc. 10. None reported. 11. Lake Ontario. 12. Very unlikely. 13. No. 14. Can't see how. 15. No cases reported. 16. *a* sixteen, *b* few, *c* epidemic, *f* twenty. 17. None. 18. Considerably. 19. Yes. 20. *a* one hundred and fifty acres. 21. Yes, one slaughter-house.

1. *Ancaster Village.* 2. Yes. 3. Privy pits. 4. No by-law. 5. 15 to 50 feet. 6. Yes, two cases. 7. Several. 8. Thrown out of doors. 9. Manure heap. 10. Don't know. 11. Wells. 12. Sometimes. 13. No. 14 and 15. Yes. 16. *c* twenty, *d* twelve, *e* ten or fifteen. 17. No precautions. 18. 50 per cent. 19. Yes. 20. *a* fifty acres. 21. Yes.

1. *Binbrook.* 2. No. 3. Field or garden. 4. No. 5. 50 to 100 feet. 6. Don't

know. 7. One or two. 8. Thrown out. 9. In the garden. 10. Don't know. 11. Wells. 12. Don't know. 15. None. 16. *c* one or two, *f* two or three. 17. None. 19. No. 20. Very little. 21. One.

1. *Flamboro', East.* 2. No. 3. Unable to say. 4. No by-law. 5. Unable to say. 6. Not as I am aware of. 7. Unable to say. 8. Can't say. 9. Manure or burned. 10. None reported. 11. Streams and wells. 12. No bad effects. 13. No. 14. Unable to say. 15. No. 16 and 17. Can't say. 18 and 19. Not aware. 20. Very small. 21. None.

1. *Flamboro', West.* 2. No. 3. As people see fit. 4. No. 5. Some too close. 6 and 7. Don't know. 8 and 9. Nearest place. 10. Not as I know of. 11. Wells. 12. Must be. 13, 14, and 15. No. 16. *b, d, f* two. 17. None in general. 18. Can't say. 19. No contagion. 20. *a* two thousand acres. 21. Sometimes.

1. *Glanford.* 2. Yes. 3. Don't know. 4. No. 5. From 100 yards. 6. Not that I am aware of 7. Don't know. 9. Fed to animals. 10. Not that I am aware of. 11. Wells and cisterns. 12. Not affected. 13, 14, and 15. No. 16 and 17. None. 19. Not as I am aware of. 20. None. 21. Very limited extent.

YORK.

Number of municipalities in County, 22. Number returning answers to questions, 8.

1. *Toronto City.* 3. Kept in pits. 4. No. 5. 5 to 30 feet. 6. Suspected. 7. Know of none. 8. Thrown out. 9. Same as 8. 10. Suspected. 11. Bay and wells. 14. Yes. 15. Some. 16. *b* twenty-five, *c* one hundred, *d* seven, *e* one hundred, *f* fifteen to twenty. 17. Know of none. 19. Yes. 21. Privy pit nuisances.

1. *Toronto City*, second reply. 2. Yes. 3. Taken to country. 4. Yes. 4. From 30 feet. 6. Not aware of any. 7. No. 8. Into sewers. 9. Removed by carts. 10. No. 11. Lake Ontario. 12, 13, and 14. No. 15. The M.D's. say so. 16. *a* four. 17. Small pox hospital. 19. Yes. 21. No.

1. *Richmond Hill Village.* 2. No. 3. No particular method. 4. Pits. 5. From 25 feet. 6 and 7. None. 8. In yards. 9. To pigs and cattle. 10. Not aware of any. 11. Wells. 12. Good water. 13. No. 14. Not noticeable. 15. None aware of. 16. *b* two, *d* two, *f* one. 17. None. 18. Can't say. 19. No. 20. Very little. 21. Yes.

1. *Markham Village.* 2. No. 3. Pits. 4. No. 5. 20 feet upwards. 6. None that I know. 7. No. 8 and 9. Thrown in yard. 10. Several cases. 11. Wells. 12. Yes. 13. No. 14. Yes. 15. 7 cases typhoid. 16. *b* nine, *c* two hundred and fifty, *d* twenty-seven, *f* twelve. 17. None. 18. 75 per cent. 19. As teacher directs. 20. *a* twenty acres, *b* forty acres. 21. Yes, to an alarming extent.

1. *Stouffville Village.* 2. No. 3. Optional. 4. None. 5. Irregular distances. 6 and 7. No. 8 and 9. Optional. 10. No. 11. Wells. 12. Don't know. 13, 14, and 15. No. 16. *b* five, *c* eighteen, *f* eight. 17. None. 18. Can't say. 19. No. 20. *a* ten acres, *b* four acres. 21. No.

1. *Parkdale Village.* 2. Yes. 3. Dry-earth closets. 4. Row, M.D., yes. 6. No. 7. yes. 8. Sewer. 9. Carted away. 10. No. 11. Water-works. 12. Not affected. 13, 14, and 15. No. 16. None. 17. Isolated as well as possible. 18. No. 19. Yes. 20 and 21. No.

1. *Woodbridge Village.* 2. No. 3. Dumped over roadside. 4. Yes. 5. From 50 feet. 6 and 7. No. 8 and 9. Thrown on ground. 10. Yes. 11. Wells. 12. Not at all. 13 and 14. No. 15. Not officially. 16. *c* twelve, *d* nine, *f* one. 17. None. 18. One-half. 19. None asked for. 20. None. 21. Yes.

1. *Georgina.* 2. No. 3. Pits. 4. No by-law. 5. Three or four rods. 6. Havn't heard it. 7. Not as I know of. 8. Thrown on garden. 9. Back yard. 10. Not as I know of. 11. Wells. 12. Not to any great extent. 13. Now and again. 14. Think not. 15. No. 16. *b* four, *d* nine. 17. As M.D. directs. 18. Can't say. 19. Not nominally. 20. *a* seventy-five acres. 21. Yes.

Article II.

VARIATIONS IN THE AMOUNTS OF DIFFERENT KINDS OF FOOD CONSUMED AT DIFFERENT SEASONS.

Some correspondence on this subject having arisen, Dr. Covernton presented a report, from which are taken the following extracts :—

The relation of weather to sickness and mortality is a very important one, and if it had happened that this diminished bread consumption invariably corresponded with an unusual prevalence of Zymotic disease as indicated by the weekly Health Bulletin of Ontario the answer might not be far to seek, as it has been clearly established that the curves of sickness and mortality group around certain conditions of temperature and moisture combined. Thus, cold and moist weather is accompanied with a high death-rate from rheumatism, heart disease, diphtheria and measles—cold weather with a high death-rate from bronchitis pneumonia—cold and dry weather with a high death-rate from brain disease, whooping cough, convulsions—warm and dry weather, with a high death-rate from suicide and small-pox. On this Continent small-pox epidemics prevail to a great extent in winter—hot weather with a high death-rate from bowel complaints, and warm moist weather with a high death-rate from scarlet and typhoid fevers.

In the absence, however, of such coincidence of diminished requirement of this particular staple of food with prevalence of sickness, the question fairly arises whether from caprice or instinctive promptings both Nitrogenous and Fatty aliments may not, at these particular periods, have been taken daily in increased proportions, and thus the necessity for the quantity of carbonaceous food—as supplied by bread—required for repair of daily waste, have been in this manner furnished. If we make a comparison of the amount of Carbon and Nitrogen daily excreted by lungs, skin, kidneys and bowels, to supply the waste of which by bread and meat alone, we shall find that, to obtain the requisite amount of Nitrogen, a quantity of bread must be consumed containing double the amount of carbon required, and that four times more meat must be consumed to supply the Carbon than is requisite for furnishing the Nitrogen.

Daily loss made good by food in a man engaged at moderate work amounts to 4,800 grains of Carbon and 300 grains of Nitrogen. Lean meat contains eleven per cent. of Carbon and two per cent. of Nitrogen, and bread thirty per cent. of Carbon and one per cent. of Nitrogen. To make up this loss on bread and meat alone there would then be required :

	Carbon.	Nitrogen.
Two pounds of bread containing............	4·200	·140
¾ pound of lean meat	·605	·165
	4·805	·305

Now, the daily consumption of two pounds of bread per head might possibly, for a continuance, be viewed as an *embarras de richesse*, and individuals may instinctively supply the requisite amount of Carbon by other articles of diet, *e. g.*, the Hydrocarbons or Fats in which the Carbon is to be found in a large proportion, as in fat meat, butter, and milk. The latter particularly, as in 100 parts cow's milk, contains :

Caseine	4·2
Butter	3·8
Milk-sugar	3·8
Salts	·7
Water	87·5
	100·0

A pint of milk may then be viewed as containing as much solid animal matter as a full-sized mutton chop, or other articles from among the Carbo-Hydrates may, at the particular time of diminished bread consumption, have been increased, *e. g.*, the starches from the potato, rice, sago, etc., or an increased quantity of sugar may have been taken either in the form of cane, grape, or honey sugars. The occasional occurrence of diminished consumption of bread from the baker may then result in all probability from changes of temperature and barometric pressure, leading to caprice in the selection of a more mixed diet, rather than to bread from the baker as the principal source of supply for daily waste of Carbon.

Without further investigation of meteorological reports of the temperature and atmospheric pressure, as also direction of winds, and Weekly Health Report at the time at which this diminished consumption has been noticed, it will, I apprehend, be difficult to refer it to any other cause than the one above suggested.

This requested enquiry into possible causes of atmospheric insalubrity may, I think, be held as a fitting, occasion for strongly urging the necessity for the preparation of Medico, Topographical, and Health Histories of counties, towns, and incorporated villages by the respective medical health officers. This, as I have noticed in a recent address by Dr. Norman Chevers, the President of the Epidemological Society of London, has for years been most successfully carried out in the Madras Presidency, and similarly good work has been accomplished in those of Bombay and Bengal. In this manner, the geographical prevalence of disease will be arrived at, and all data needful for pursuing an enquiry into origin and cause provided. Thus, early history of epidemics of a paludal or zymotic character in low-lying country will, on fresh occurrence of either, lead at once to investigations into existing conditions of drainage, sewerage and disposal of sewage, and by prompt remedying of defects, the inhabitants on finding that diminished sickness and death-rate quickly ensued, would not be slow in recognizing that their preconceived notions of the efficacy of the drainage previously effected were misleading, and thus be reconciled to the cost. I remember well when the country around Dunnville was the perpetual *habitat* of fever, and fever of the most pernicious kind. In the present day, by the draining of the land, consequent on the cutting of the Welland Canal and subsequent Government works, the death rate is little higher there than in other more elevated sections of country. Dr. Chevers recommends that, " in these Health Histories should be recorded all needful geological and meteorological data, brief descriptions of the water supply, and systems of town and land drainage, a history of all reported epidemics, endemics and epizoötics, the dates of the first appearance and disappearance of the recent ones being accurately given ; all that is worthy of recollection as illustrating vital statistics, especially recent death rates ; full health histories covering the last five years ; numerical lists of the prevailing diseases, with brief but clear accounts of those which point to the fact that the land is malarious, or the town air impure ; that, in short, these little works should comprise every fact which tends to illustrate the medical topography of their localities. Maps should accompany them, defining with rigid accuracy the locality and original extent of all extant or reclaimed lakes, marshes, harbours, bays, estuaries, water-courses, and, in this country, land flooded by mill-dams. A good deal of this information is supplied by our Weekly Health Bulletins, but as they have only reference to present conditions, without any information on the past, these Health Histories, if they could be generally supplied, would add materially to our knowledge of sanitary shortcomings of particular places, and greatly facilitate the work of the Provincial Board. All of which is respectfully submitted.

CHAS. WM. COVERNTON, M.D.

Article III.

REPORT OF THE COMMITTEE ON EPIDEMICS.

Report on Epidemics.

Mr. Chairman and Gentlemen,—It may possibly be held that after the carefully prepared pamphlets largely circulated last summer, on the best methods to be employed for limiting or preventing the spread of contagious diseases, the duty imposed on me of reporting on this subject would be a very light one, but, as the aim of this Board is to be thoroughly on a level with everything on this subject, I consider it not only expedient, but eminently fitting that, at our first meeting for this year, I should put you in possession of the views on this subject of my foreign confréres of the International Congress of Hygiene, last year assembled at Geneva. Leaving the question of snpplementing our pamphlets with such of the precautions as do not find place there, and of the addition of minute details of procedure, to your judgment, I will only very briefly refer to the paper of Professor Corradi, of Pavia on the question of the contagion of consumption, because I think all the members of this Board are in accord that the views entertained by that scientist, although ultimately they may be proved to be correct, are not possible of universal application — particularly his idea of patients in isolated hospitals; there are, however, a few conclusions to be derived from his paper that may not be deemed out of place. 1st. That clinical observation should decide the question that experiments and researches have so prominently brought forward—that it is the task of pathology to solve other questions maintaining the doctrine of a parasitic nature of tuberculoses, and to harmonize this doctrine and the fact of hereditary predisposition. 2nd. That if contagion or transmission is possible, it can only be under conditions yet to be determined. 3rd. That in the meanwhile, hygiene in reference to consumption should be the same as it would be for any other suspicious malady, that is to say, capable of being communicated or transmitted under certain conditions. 4th. Particular regard should be paid to the connections that co-habitation establishes, in rendering them less intimate and prolonged ; the effects of focuses of infection will be weakened, even if they cannot be destroyed, at the same time the effect of exhalations of the patient, which, apart from any specific action, weakens the organism and predisposes it to phthisis will be minimised. 5th. Although it has not for a certainty been demonstrated that aliments may communicate consumption, it will, nevertheless, be prudent to abstain from the flesh or the milk of phthisical animals. 6th. That henceforth it will be necessary to take the greatest possible care that the quality of the vaccinal lymph, bovine or human, is beyond all doubt as to its source. 7th. That the sputa from consumptive patients, as spat up, should instantly be disinfected.

Prophylaxy of Typhoid.

Dr. Jules Arnold, in his paper on this subject, says that whilst it is most reasonable to include this disease as among the parasitic diseases, in presence of the divergence of opinions of experimenters on the particular type of the supposed parasite, we can hardly yet regard it as an established fact. That the media of retaining and eventually of reproducing the typhogenic agent are

(*a*) The Soil—more from surface than from deep soil.

(*b*) Water—probably only for a short time, and dependent on the degree of organic impurity.

(*c*) Air—air of streets contains more microbes than the air of open country, and the air of dwellings more than the air of streets.

But the pathological products of typhoid fever passing from the patient in a moist state are only likely to infect the air after the time necessary for their dessication and pulverization. The air in effect acts only as the vehicle of infectious corpuscles, and not by other emanations that may be permeating it, such as gases, vapours, odours, even when these emanations may proceed from latrines or drains. The prevention should be directed

1. Before epidemics have appeared (*a*) To the media of retention of the typhogenic agent; to protecting the soil of inhabited residences against the penetration of this agent; to the general cleanliness of the streets; to the suppression of recipients of fœcal matter in the house; drainage of soil; to the carrying away instantly excremental matters; to supply urban or rural centres with water from a pure source, brought from a distance by conduits protected along their whole course from pollution; construction of houses—and particularly houses in flats, or boarding houses—in such a way as to preserve them from the stagnation of atmospheric dusts, and to secure for them very free ventilation.

2. During epidemics (*b*) with regard to the typhogenic agent—treat it as a real parasite. Disinfection, general and special (*c*) with regard to the patients. The isolation of patients is not rigorously indicated, but might possibly be safer than free intercourse; separate from the patients all persons supposed to be peculiarly liable to receptivity; remove all media and focuses of infection; watch over those who have come from fever houses.

International Prophylaxy.

Digest of a Paper Read by Dr. da Silva Amado, Professor of Hygiene, Lisbon.

The basis of all rational systems of International Prophylaxy ought to be the creation of a body of International Sanitary Physicians, resident in cities or localities where pestilential endemics obtain, who should be sent to wherever an epidemic of the same nature is developed. These physicians should have for their mission—

(*a*) The study of the form of the disease.

(*b*) Giving uniform advice to all the Governments whose officers they are.

(*c*) To assist the Consuls in the sanitary inspection which should be made of all ships at the port of departure, before a clean bill of health is delivered.

3. Quarantines, such as at present exist, are nearly useless for public health, and very prejudicial to commercial interests, as the time that the quarantine lasts is too long for a disinfection properly carried out, and too short for the effluxion of the period of incubation of pestilential diseases.

4. The pretended chemical disinfection of luggage and merchandise that is practised in these lazarettos is, in reality, nothing more than an aeration more or less insufficient.

5. Every quarantine for individuals should be limited to twenty-four hours, sufficient time for examining passengers and their belongings, to ascertain if there is among them latent or suspected disease, and to disinfect all baggage by heat.

Disinfection of the Rooms of Patients after Contagious Diseases.

Conclusions from Dr. Valins' Paper.

In every locality police regulations should be put in practice to assure the perfect disinfection of the room, and of objects contaminated by persons who have been seized with the following diseases:—Small-pox, scarlet fever, measles, diphtheria, typhoid fever, petechial typhus, cholera, puerperal infection. This disinfection is particularly necessary in hotels, boarding-houses, furnished lodging-houses, and houses common to a number of tenants. These disinfections imply an obligatory announcement of cases of contagious disease, the appointment of officers for carrying out details, and also for watching over inmates, as also the imposition, by by-law or statute, of penalties on individuals seeking to evade the law. These ordinances should be brief and precise; they should be accompanied by instructions intended to be circulated broadcast among the people of the infected houses, and of the neighbourhood, and wherever there is danger of this kind to be avoided or measures to be taken. The instructions should contain the following recommendations which may vary according to whether the patient still occupies his bed-room, or according to whether it has been vacated by convalescence, death, or removal.

Measures before and durinq Infectious Diseases.

The room alloted to the patient should be an isolated one, without communication wtih other occupied rooms. The closure of outlets by curtains impregnated with a disin-

fecting solution will be only of limited use. The employing of neighbouring rooms is a preferable measure. Before the arrival of the patient, or from the time of his arrival, every object easily impregnated with the disease, and that is not of absolute necessity, should be removed from the room, so that there may be no occasion for disinfecting them, or, later on, of destroying them—carpets, valances, furniture covered with velvet or worsted, stuffed furniture of any kind, drawers and their contents, etc., etc. Visitors must be restricted, as also nurses, to these only that are strictly indispensable. The nurses should always wear over their dress an overall or wrapper, to the feet, of some material easily washed, in order to protect their garments from defilement. In case they are compelled to leave the room for a short time, they should put off this wrapper and hang it in the patient's room. Every visitor should consider it absolutely obligatory to wash his hands in a solution of Thymol, two parts in a thousand, or Carbolic acid. Body or bed linen soiled by the patient, soiled bandages or dressings, should immediately be plunged into a basin left permanently in the room or one of the closets, containing a disinfectant solution—Chloride of Zinc, 10 grammes to the litre, will answer the purpose, but with advantage, to this may be added several grammes of impure Carbolic acid, to avoid all danger of infection. After several hours of immersion, the clothes should be wrung out and sent directly to the wash-house. Sponges, instruments and canulas ought to be disinfected in the same manner. The passages from the bowels should be received in vessels always containing a certain quantity of a disinfectant, 2 per cent. solution of Chloride of Zinc, of Sulphate of Iron, of Chloride of Lime, 5 per cent. solution of Sulphuric or Muriatic acid. Every day before dusting or sweeping the room, damp sand should be sprinkled on the uncarpeted floor. In the case of desquamative diseases—small-pox, scarlet fever, and measles—it is desirable to leave permanently on the floor a thin layer of moistened sand. The moistening to be by an antiseptic, as Chloride of Zinc or of Lime. Each day the sweepings should be burnt on the hearth-stone in the patient's room, or in the grate. Shaking and turning over pillows, mattrasses and bed-clothes of the patient should be avoided; it is preferable to renew the bedding from time to time, and to subject them to a thorough purification. Pillow-cases and mattrasses filled with bran or oat-straw is very serviceable; they form a sufficiently comfortable bed, and can be burnt when soiled. It is desirable to have permanently in the sick chamber a brisk, open fire, to renew the air, hinder the diffusion of miasms from without, and to partly purify the air rendered impure by inclosure. A continuous ventilation by air-holes from without, or the upper sash of the window partly open, will contribute both to recovery and disinfection. In certain cases it will be desirable to cast on the walls and in the atmosphere of the sick room a spray of some disinfectant solution—atomized solution of Thymol, with an addition of Spirits of Wine, 2 per thousand, or of Carbolic Acid 1 per cent. The walls should be at least twice a week cleaned, either with a sponge or cloth dampened with the same solution. Experience has not yet sufficiently demonstrated the efficacy and harmlessness of the disengagement in the room occupied by the patient, oxygen gas, ozone, ozone ether, or azotite of ether, sulphurous or nitrous acid in weak and continuous quantities. These means would certainly seem to be capable of rendering good service from the standpoint of disinfection and destruction of miasms. In case of death the corpse should be washed with a strong solution of Chloride of Lime, 10 per cent., and enveloped with a cloth moistened with the same liquid. The body should be covered over with sawdust, strongly carbolized, and the coffin hermetically closed in the room where life terminated, up to the moment of its removal to the burying-ground.

Measures to be taken after removal of the body from room.

Chambers to be disinfected by the following means :—

1. The rapid disengagement of large quantities of nitrous acid gas (copper filings 300 grammes, nitric acid 1,500 grammes, water 2 litres) is a powerful means, but dangerous for persons and goods—can only be employed in rooms completely bare, and in cases of extreme defilement.

2. Sulphurous Acid is the most practical measure; the least unreliable and the least dangerous for furniture, and the most economical for procuring disinfection of contaminated apartments.

3. After this, fumigation should be continued for twenty-four hours; the walls, if they are unpapered, should be scraped and whitewashed with quick lime (no chalk nor size added). The wood painting should be lime-washed. The wall-papers should be entirely scraped off.

4. Woollen and silk materials, curtains, clothing and carpets should be hung up in the room in such a manner as to facilitate the access of the sulphurous acid. Almost all of these materials bear, without appreciable alteration, these vapours. Mattrasses and cover-lids should in the same way be spread over trestles or chairs. The mattrasses, as much as possible should be picked to pieces. The wool and hair should be teazled and exposed to heat—212° Fah.

5. Linen and cotton dyed fabrics, certain woollen and silk materials badly dyed, may be affected by the sulphurous acid; it will then be necessary to make these articles up into bundles, and when opened out expose them to hot air at a temperature of 110 Centigrade.

6. Numerous experiments have shewn that this temperature continued for two hours, especially moist heat at 100 Centigrade, does not affect the tissue, and destroys almost all morbid germs. Spores alone resist a temperature of 130 Centigrade, as also very concentrated sulphurous acid.

7. It is desirable that in all great centres of population, proper disinfecting apparatus by heat should be supplied.

8. Mattrasses, which are often the receptacle of dangerous germs of contagion, should be treated as above, either by dry or moist heat, temperature 110 Centigrade.

9. Straw mattrasses—contents should be burnt, and the tick repeatedly soaked in boiling water.

10. Clothes of little value should equally be burnt.

11. The disinfecting officer should take great care that no article or vestment contaminated has not been concealed or removed from the disinfecting processes,

12. The disinfected room should be left unoccupied for at least eight days; during the whole of that time the windows to be open night and day.

The water-closets of the house should be disinfected by pouring down the soil-pipe a concentrated solution of sulphate of iron 6 kilogrammes for 50 kilogrammes of water, or better still, from 5 to 25 litres of unrefined coal-oil.

Prophylaxy of Diphtheria.

Conclusions from Dr. Henrot's paper on the subject.—

1. The mortality from Diphtheria increases in alarming proportions in France and in several countries of Europe.

2. There exists a scientific means for preventing infectious diseases, and particularly diphtheria, by the respiratory passages—it is the use of a respirator of antiseptic cotton wool. The elements of contagion are thus arrested at the mouth and nasal fossie, straining and purifying the air as a charcoal filter purifies water. The physician should consider it his duty to impose the use of such a protective apparatus on the pupils, hospital attendants, on-nurses, and all persons who, from necessities of the profession, are obliged to expose themselves in dangerous places. Instance a hospital ward badly infected by diphtheria.

3. Diphtheria has only become so fatal in recent years, because little precaution has been taken, and that antiseptic whitewashings, lime washings or garglings of the pharynx often repeated, have been neglected.

4. Antiseptic dressings of the respiratory passages will bring about in medicine as considerable a progress as the sister dressings have accomplished in surgery.

Chas. Wm. Covernton.

SUMMER RESORT FOR CHILDREN.

Vanneatrap of Frankfort-on-the-Maine "On colonics for invalid school children." At the cellent papers read and discussed at the Intercolonial Congress of Hygiene assembled at Geneva last September, was a very interesting and practical one by M. Le Professeur Varrentrap of Frankfort-on-the-Maine "On colonies for invalid school children." At the conclusion of his very interesting narrative of what had been already accomplished by his great work, Mr. Varrentrap expressed the hope that all representatives of governments and large cities would, on their return to their respective homes, endeavour to promote similar organizations. In accordance with this desire I have prepared the translations that after a brief preface I shall read to you.

It may possibly be argued that whilst in large cities in Europe where poverty and its frequent accompaniment, unhygienic surroundings abound, such institutions may be a necessity; in Canada where as a rule a sufficient supply of healthy food is within the compass of every sober and industrious artisan, mechanic, or labourer, their children are rarely to be found as strongly appealing to the sympathies of the people for similar aid. This objection in rural municipalities would certainly be ordinarily a valid one, but the question, I think, may arise whether in our large cities such a benevolent work, would not prove a crowning addition to the numerous and excellent charities already in operation.

It is of great importance for the existence of any nation that the physical and mental health of its children and youth should be carefully guarded and kept at its highest possible point. Every healthy adult male is computed, I believe, to be worth to the State two thousand dollars, may not then an enquiry, even from the lowest point of view, into the needs of the feeble school children of our cities be viewed as one commending itself to the authorities and general public. There is sufficient reason to believe that the school children have frequently assigned to them work during school hours and at their residences, disproportioned to their physical and mental ability to undergo without evils of a physical or bodily nature resulting. In the case of children of scrofulous diathesis the long constrained attitude at the desk during this formative period of life is apt to leave its mark. According to Hert the curves of the spine even which are so pronounced in adults, are entirely lacking at birth, and do not appear until the fifth or seventh year, these curves resulting from weight of body. This extreme view however, may fairly be open to doubt, but one thing is quite certain that lack of fresh air, healthy food, and requisite exercise produce debility in children much sooner than in adults.

In the scrofulous the mental powers are frequently prematurely developed, any arrangement therefore which necessitates the same number of hours for children below the age of twelve, as obtaining for pupils ranging to the age of sixteen, must for the strumous be fraught with danger, as with their precociousness of mental power, there is generally an accompanying dangerous ambition to excel, prompting an amount of exertion of brain power that if long continued cannot fail to illumine the seeds of disease that under more judicious management might for long have remained dormant. Mr. Edwin Chadwick in his work on the "Half time system in Education," says a child of from five to seven years can attend to one subject—a single lesson, about fifteen minutes; from seven to ten years about twenty minutes; from ten to twelve years about twenty-five minutes. The English half-time system is a plan for educating the children of the labouring classes, by sending them to school three hours a day and employing them on farms or factories for the remainder of the working hours. It is generally found in England that children thus employed make as good a progress in study as those who attend school six hours a day. In the case of girls there exists special reasons for relaxation of discipline or requirements—to mention only one, their growth for two or three years, from the age of eleven or twelve, onwards, is very rapid. In the absence of reason for believing that our city school houses as regards site, drainage, construction, ventilation, heating, form of school desks and seats, requiring mental application and intervals for bodily exercise leave nothing to be desired, then I apprehend the number of scholars eligible for nomination for such charities as school colonies will be fractionally

small in this favoured land of ours; but it must always be remembered that although the hygiene of the schools may be perfect, there will yet remain another increment of feeble health in the unsanitary condition of localities and residences of many of the children of the poorer classes, and from these sources an opportunity may be afforded in a few years from now of contrasting results of Canadian organization with those related by M. Varrentrap. I certainly incline to the opinion that here as has already been accomplished in some American cities, good work in this particular may be recorded. I conclude, Mr. President, these necessarily brief prefatory remarks, with a short extract from a speech of Sir James Paget at the intercolonial exhibition of 1881:—"The wealth of a country depends in only a very secondary degree upon its climate and its soil, its mines and its industries. Its agriculture and its industries depend far more upon the will and power of its people to work, and such power depends upon strong minds and strong limbs, and these in their turn are dependent upon, and could not exist without, health. In this country therefore health is pre-eminently wealth, and he who does not all he can to promote health, forfeits his right to wealth, and is guilty of the basest want of patriotism."

School Colonies During the Holidays.

Paper read by M. Le Dr. Varrentrap, Sanitary Councillor, at the Meeting of the Fourth International Congress at Geneva, Frankfort-on-Maine, 1862—Translated by C. W. Covernton, M.D., Member of the Congress.

Gentlemen,—If I have permitted myself, in response to the flattering appeal of your committee, to make known the results obtained by school colonies during the holidays, I have done so because the subject is a novel one. Notwithstanding that the work has rapidly spread in Germany and in Switzerland, it is elsewhere almost unknown, and the results of this organization have not hitherto been published. It is, then, that which I propose doing to-day. In proportion to the importance of preventive medicine being better appreciated, has attention been directed to childhood and to the means to be employed, whether for the preservation of health in the school and in the home, or whether for the arrest of the first symptoms of disease or of any interference with normal development. I only now speak of the procedures recently thought of for favouring the physical development of the children of the poor attending the schools. It is of the first importance to send these children during the summer holidays to a pure air, when possible, to a mountainous region or to the sea border, where sea baths or mineral baths can be taken where they are indicated. With this end in view there have been established for a number of years, first in England, seaside hospitals for the benefit of delicate children, especially for the scrofulous. France and Belgium have imitated this example. Recently it has been in Italy that the greatest attention has been devoted to this organization, as it now can boast, in almost every province of the kingdom, of a maritime hospital, organized and duly fitted for the reception of several hundred children. These hospitals are supported principally by the annual contributions of the inhabitants of the several provinces. Germany is beginning to follow this good example, especial credit being due to the efforts of Professor Beneke, and the organization of saline baths has recently made great progress in this country. In other places we have to notice the establishment in recent years of what is called "Holiday Colonies." They have for their object the sending the poor and sickly children of cities under the watchful care of masters and matrons, far away from their squalid homes to breathe on the mountains, or at the border of the sea, a pure air, with the combined advantage of wholesome and abundant food and of daily exercise. Healthy and robust children, living even under favourable conditions, are often greatly weakened, by a long six months' course of study. The same remark applies to robust persons, but who, fatigued by prolonged intellectual work, are obliged to seek renewed strength by a temporary change of their mode of life. Success will be much greater by contrast with the wretched, puny children of the poor, inhabiting unhealthy houses, and who have frequently insufficient and poor food. These theoretical views have been confirmed by experience. The experiments made during several years in a certain number of cities

have proved that a residence of three or four weeks, under favourable circumstances, has exercised on the children an influence not merely transitory but durable. This, I am prepared to prove by facts. I will say, first, a few words on the organization of these colonies. It is a remarkable fact that it is to be found the same in the north and in the south of Germany, in manufacturing and commercial cities as in others, and that on the following points: It has been recognized that the age of eight to fourteen years was that within the limits of which it was desirable the work should be fixed. Younger children require too much care, and cannot conveniently be associated with the elder. As a general rule, the young girls appear to have more need of an invigorating holiday. They are kept at the house by various duties, particularly in the charge of younger brothers and sisters, whilst the boys sport and frolic in the public streets. As regards the choice of colonies, this is the way it is effected: Communications are addressed to the school authorities to obtain from the masters and mistresses a list of the children to whom the benefit of change of air may appear most necessary. These children are submitted to a medical inspection in order to determine the general state, noticing external appearances, state of nutrition, weight and size of body, chest development. A definite choice is then made of those who appear the most eligible from their invalid and weakened condition, the number chosen to be within the limits of the means at disposal. Positively diseased children must be excluded (the scrofulous reserved for the mineral and sea baths). Those suffering from opthalmia, and to whom a glaring light, wind and dust would be hurtful; those suffering from incontinence of urine, Epileptics and Choreics. The children admitted are divided into colonies of ten, twelve, fifteen and maximum of twenty, who are placed under the direction of a master and mistress. It is preferable, when possible, to reunite the children of the same school with their master, as he will find his task made easier when he is acquainted previously with his pupils. It is often advantageous to group children of different ages, especially young girls, who can render each other mutual services. In the concern of the choice of, and the position of, a superintendent, a very exact method of government has not been determined on. Evidently, the master ought to be a firm man, full of warmth and heartiness, affectionate to the children and to the work specially confided to him. Some committees have associated his wife with him, to give to the children the sentiment of a family life. In the case of numerous colonies of twenty to forty children, two superintendents have occasionally been attached to render the task, whilst, at other places, it has been estimated that a single superintendent would be more active in his work of overlooking, two running the risk of having their attention diverted, particularly when out walking, by the charm of conversation. On this point, experiences are not sufficiently conclusive. At Frankfort, one master only is placed at the head of each colony, but to him is entrusted the entire and constant responsibility of his flock. The equipment of the children deserves care. They must have a separate suit besides the one they have on. The shoes, especially, should be strong and in good condition. If the committee have to advance money for outfit, it should be done in prudence, to avoid the parents having in view the sole object of having them gratuitously clothed. The residence in the mountains ought to be a veritable holiday, with not the slightest approach to either school or study. We must have only in view the physical development of the children; to accomplish that, to make them live as much as possible in the open air, to habituate them to cold ablutions, and to river or sea bathing, to occupy them in walking, gymnastics and different games, according to their choice or ability to bear. Rainy days should be devoted to lecture, singing, and writing to their parents, arrangement of plants and of objects for forming a collection. The child who escapes from the noisy streets of a city knows but little of the beauties of creation, of the charms of the open country, of the splendours of a beautiful sunrise or sunset, of the variety and utility of animals and plants. The master ought to take advantage of the faculties of observation and of judgment of his pupils, to reveal to their senses this new world for them, and for extending, whilst strengthening their bodies, their intellectual horizon very differently than can be done in the school-room.

In other ways occasions will not be wanting for inculcating on the children habits of obedience, of kindly intercourse and politeness with comrades, of good behaviour

table and in out-door exercises, of order and neatness in dress and in sleeping rooms—The master may be felicitated on having so good a field and such favourably conditions for accomplishing success. The choice of place should be made with care, it must not be too near the city, as then the parents' visits would be too frequent; nor too far, on account of the expense of transport. The place should not be ordinarily visited by tourists and strangers, and as much as possible should be in proximity to forests. It ought to offer security from the point of view of accidents, as also for obtaining good food, particularly fresh meat and pure milk. The residence should be in a salubrious position with well lighted rooms, large and cheerful; care should be taken that the sleeping rooms should have as the minimum, a capacity of ten cubic metres per head. It will be desirable that the master should have a separate room from whence he could overlook the children during the night, and a large room or hall for assembling the children in rainy weather. For this object a school-house would answer. The Frankfort committee have found without difficulty this desideratum. The children should have given to them fresh meat at least five or six times a week, morning and evening, bread and milk at ten o'clock a.m., and at four p.m. rations of bread. At dinner a free allowance of vegetables. It is desirable to fix in advance and in writing diet tables, and the Frankfort committe have noticed with pleasure the adoption in other places of the models of their convention, whether as regards the schedules of law and regulations, the boarding-house keepers or the superintendent of the children and other particulars enjoined at the time of the medical inspection and registration of the children selected. By the side of Colonies properly so called such as I have described, other trials have been made having the same object in view, notably in Denmark; within the last ten years they have placed, yearly, an increasing number of children from the Danish schools amongst honest and industrious small farmers—generally they received only, under one roof, two or three who were received as members of the family and associated in the work of the house or labours of the field, generally a small indemnity was paid by the Government for board but many were received gratuitously by the owners of the land in good circumstances or rich. The railroad and steam boats transport the children gratuitously, and the public journals open liberally their columns to all communications relative to this great work, so that the expenses are nearly *nil*. It may be said that in this country it has become a national work, as in late years about 7000 children are yearly placed in the country for several weeks. In Germany it is the city of Hamburg, particularly the benevolent school association of that city that has followed this plan. In 1876 this association sought to place gratuitously sickly children for some weeks, amongst charitable and well disposed people. From 1876 to 1881 the attempt was made succesively with 7, 11, 12, 19, 14 and 11 children, but to give more extension to the work a public appeal was made for offering a small indemnity, such as from ten to fifteen marcs, about 11 and 16 shillings, English, for a residence of two or three weeks—clergymen and school teachers or other qualified persons were obliging enough to give their advice on the choice of localities and of families, and also undertook the charge of a frequent superintendence of the work. As much as it was possible ten to twenty-four families capable of receiving, each, two or three children, in the same locality, so as to facilitate the task of the voluntary inspectors; more than 700 children have been in this manner placed in the country during the last six years. Bremen has followed the example of Hamburg, principally through the intervention of M. Reddersen, principal of the High School.

At Berne, in Switzerland, colonies have been organized in a somewhat different manner; the children have been collected in groups of about forty and lodged in houses hired for the occasion, at their head has been placed a master and his wife, as overseers, their business, to look after the stores, collecting and looking after the beds and bedding, kitchen utensils and food; another master as Superintendant, and in the case of girls a Matron and a Cook complete the staff. The meals prescribed night and morning are bread and milk at noon, four times a week meat, with two kinds of vegetables; twice a week rice with eggs, and dried fruits every day; soup, bouillon or flour, and bread at discretion—The cook the only paid member of the colony. In 1880 a colony of forty-two young girls, and another of forty-four boys, with three young women to assist in the

kitchen and in the needle-work, was thus established. In 1881 the first colony numbered forty boys, the second forty-eight young girls, the third thirty-two young girls from six to fifteen years of age, and sixteen boys from six to nine years. Vehicles in sufficient number were gratuitously offered for the transport of the children and attendants.

Barmen: another system has been adopted—Sickly children who could neither be sent to mineral baths nor to the country, were received in a large gymnasium night and morning, they were given an abundant meal of bread and milk, at dinner they dined with their parents, and the interval of meals was occupied in long walks under the influence and direction of masters and mistresses; in addition, the authorities of the town are about establishing a hospital for scrofulous children at the baths of Konigsborn.

Elberfield organized a milk cure for 130 infants in 1881, and in 1882 for 220; Dusseldorf, in 1881, for twenty children, giving them also their dinner. The first holiday colony for school children was established in 1876 at Zurich by M. Bion, one of the clergymen of the town. In Germany, it was at Frankfort the work was commenced, the good effects of which were made promptly known by annual reports. It spread to a number of cities—in 1879, to Dresden, Stuttgart and Vienna; in 1880, to Barmen, Berlin, Cologne, Leipzig; in 1881, to Breslau, Chemnitz, Dusseldorf, Elberfield, Hanover, Carlsruhe, Konigsberg, Lubeck, Magdebourg, and Nuremburg. In the same year, the good work was established in Milan. As far back as 1876 and 1877, poor children were gratuitously received by country people in the neighbourhood of Hamburg. Besides those received without charge, there have been sent, in recent years, to the country, a much larger number of children, for whom has been paid a small indemnity for board. Bremen imitated the example in 1880. At Bâle, in Switzerland, the work was commenced in 1878; in 1879, at Berne and Geneva, and in 1880, at Neuchâtel. Hamburg, as at Zurich, at the commencement, kept the children in the country or at the seaside for a fortnight only, but at both places, latterly, the sojourn has been extended to three weeks. The same has happened at Dresden, Leipsig, Magdeburgh, and Nuremburg. Other cities have adopted a sojourn of from twenty-three to twenty-nine days. The expenses have varied in different cities. For the sixteen German cities who have organized these school colonies, the expense per head per day, everything included, has varied from 1 marc 30, to 2 marcs 90; average, about 2 marcs. This average, without doubt, will have a tendency to diminish, for the rule of expenses of installation, purchase of material, will, before long, disappear completely or be a mere trifle. At Hamburg, the expenses have been between the limits of 0.30 to 1 marc .03. At Barmen, about 80 pfennings; at Zurich, from 1 franc 71 cent., to 2 francs 54; Bâle, 2 francs; Berne, 1 franc 10 cent.; at Geneva, 1 franc 95 cent. to 2 francs; Milan, 2 francs 28 cent. These expenses have notably been increased by the wages paid to the superintendents and others. At many of these German colonies, they have been paid, averaging three marcs a day. In Switzerland, excepting the Geneva colony, the services have been gratuitous. Observations made on about six thousand children, particularly when made by the same methods and agreeing in different localities, allow us to bring valuable experience to bear on the success of the enterprise. The end in view, as has been before remarked, was to strengthen feeble and sickly children by a sojourn in pure air, with bodily exercise and an abundance of wholesome food. Experience has proved that this aim has been accomplished. In all these school colonies, the sleep and appetite of the children has been excellent. At the end of the holiday, their healthy appearance and increased strength was noticeable. Those who, on their arrival, had been fatigued by the travel of an hour or two, had become more or less rapidly capable of active exercise of several hours' duration. In order thoroughly to appreciate the amelioration of the physical condition, the idea was first entertained at Frankfort of weighing the children at the commencement and at the end of the holiday, and to compare the result of these weighings with the normal augmentation of a child exposed to the ordinary conditions of life. With that view they have been classed according to age and sex, and in this way established the gratifying fact that the larger number had exceeded from four to eight times their normal increase. This experience has all the more value from the fact that nearly all the colonies have followed the methods indicated by Frankfort,

and have furnished analogous results. It has been asked whether this augmentation of weight represented a durable increase of strength, or if it was only the product of an accumulation of matter, without either value or durability. To ascertain this, we have made, four weeks after the return, a third weighing; afterwards a fourth, at the expiration of four additional weeks. To our great satisfaction, other colonies have imitated this trial, and at Breslau it was repeated after six months' return from the country had elapsed. The result of these observations is the following: During the first four weeks after the return, the augmentation of weight was feeble, and sometimes even changed to a trifling diminution; but, at the end of the second period of four weeks, among almost all the children, might be observed a notable and rapid augmentation. In taking the minimum of each colony, it is found that the increase of weight has been from 2 kil. 12, at Dusseldorf; from 2 kil. 25, at Barmen; from 4 kil. 69, at Cologne. In other colonies the minimum observed has been: once, 62 grains; once, 79 grains; three times, 93 to 98 grains. In forty-two cases the minimum oscillated between one and two kilogrammes; the total being 1 kilog. 32, for the boys, and 1 kil. 48 for the girls. If Cologne is added, these figures change to 1 kil. 44, and 1 kil. 63. The augmentation of weight has been a little less than the Swiss colonies, because the holiday was there shorter than in Germany. In several German colonies, some observations have been made on the increase of height; scarcely was there found an augmentation of two centimetres during three months. The observations, however, have not been, up to the present, either sufficiently precise or sufficiently numerous. In some colonies an attempt has been made to determine also the development of the chest and pulmonary capacity, but, it may be asked, whether it is not difficult to arrive at results sufficiently precise to compensate for the trouble taken. At Milan recently, an attempt was made to gauge the increase of muscular force. In addition to the experience already described, may be mentioned another fact that holiday colonies have revealed, viz., that the children who had an aversion to water, and especially to cold water, quickly after their arrival in the country, took pleasure in cold baths. This gave them a taste for cleanliness, and even also for general neatness. Further thanks to the constant supervision of the masters and matrons well qualified for their task, the children in behaviour and general conduct were transformed. They gained in politeness and mutual support, and attached themselves to their masters and mistresses. On their return to school, it was frequently recognized that they behaved better and took a greater interest in their studies. The multiplied experiments which have been made permit us then to arrive at the conclusion that holiday colonies have satisfactorily answered the hopes entertained, equally from a physical as from an educative and moral point of view. This, however, ought not to hinder us from pursuing the amelioration of the work in all its details. The general interest which it has excited has provoked analagous attempts worthy of appreciation. Remembering, however, always to put particular cases in their proper places, and not to establish comparisons between different means, which do not exclude but require to be employed for the purpose. Sea baths, saline, or mineral baths are often of unquestionable utility for scrofulous and other diseases, but they would not be applicable to school colonies in general. Ordinarily such baths are neither necessary nor opportune.

Some individuals desire and expect more, as a result of these colonies, the advantages of a moral education than simply hygienic advantages. We do not deny the very great value of moral influence, but if it is considered of the first importance to reform, it may be asked whether the methods should not be modified. The essential purpose of the Institution such as it was at first originated at Frankfort and at Zurich, both by Physicians and Clergy, was to fortify the physical well-being. Moral cases were not however neglected as we have indicated by the Reports of the Frankfort committee. An opposition without sufficient reason has been made by those who prefer placing children separately amongst country families. It is evident that there is nothing to be said against this method when families are to be found small or large proprietors a short distance from a city, with sufficient guarantees for due guardianship. It may be well to persevere with this system even to develop and improve it; but it cannot be argued that it is the best; in all cases it merits great consideration, were it not only for the reason it involves only one-half or less than half the expence of the other, and thus

healthy resorts may be attainable for double the number of children. It should not therefore be lost sight of, and trouble should be taken to find a sufficient number of people resident in the country to whom, with all confidence, two or three children might be sent for a few weeks during the holidays. Among farmers desirable situations might be found, but in the neighbourhood of cities where rural habitations are occupied by workmen who come every day to the city for their occupation, the conditions are certainly not favourable. Two fundamental errors may be noticed in the advocacy of those urgently favouring this system: They appear to think, 1st, that parents living in cities who confine their children to holiday colonies, have unsupportable and badly regulated households. 2nd, that the families of villagers present the *beau ideal* of a simple and becoming life, sober and laborious. Now, exceptions are far from wanting in both instances. On the other side we cannot estimate too highly the benign influences of intelligent and properly qualified superintendents. In four weeks, if the colony is not too numerous, they can exercise pedagogical influences far greater than would obtain in country families, who could never devote to the children entrusted to them more than a very limited time and attention. Besides, the intercourse of companions who are constantly watched over and guided, constitutes an excellent means of education. These questions have been already discussed, thoroughly, at the conference of committees of these colonies, held at Berlin in November 1881, and in the Report of the Charitable Association of schools of Hamburg, for 1881. That which was most forcibly spoken, will be found in the papers of Mr. Reddersen. The example of Berne, certainly deserves careful attention. Then they have endeavoured to unite the advantages of direct superintendence of the children, by excellent Masters, with the conditions of the most economical boarding. The details given in the second and third Report certainly appear favourable to the system. But it might be asked where elsewhere may be found appropriate places, teachers, or rather directors, equally qualified for the task and the same number of people enough interested in the work for procuring gratuitously carriages for the transport of children and for bringing abundant gifts of bread and meat, vegetables, and other commodities. It will be seen that the question is one, not only of extending to a larger number of cities and of children, a work already sanctioned by experience, but to examine thoroughly, and to ameliorate on numerous points, its interior organization.

In conclusion I will allude to the physical results of these colonies, on one point. For the weight and growth of the body I have made a comparison between the results obtained, and correct corresponding figures furnished by Quetelet. All the other reports have followed suit. I would beg them to take one step in advance and in the future, for terms of comparison of Bowditch, 1863, '67, of Dr. C. Roberts, 1878, and of Beneke, 1881. They are more numerous and moreover more reliable for consultation. Gentlemen, I have adduced nothing new, nothing to excite commotion or rivalry; but I have spoken to you of a good work which, in sixteen years, has included six thousand children, and has had every where a most surprising success, a good work which merits imitation every where, my wish is that on your return to your homes you will endeavour to bring about something of the same sort next summer.

In the discussion that ensued on the paper, Dr. Cristoforis said he entirely agreed with M. Varrentrap. The Milan Society sends the children to the mountains from 800 to 1,000 metres above the sea level. They remain there for thirty days. Dr. Pini, of Milan, said Professor Varrentrap had raised the question of determining whether the time of twenty to thirty days of sojourn in the country for school children is sufficient. He was of the opinion that one month sufficed. The question was to prevent and not to cure, and, with that object, thirty days of an active, hygienic life, with good nourishment and good air, sufficed for restoring the health of children debilitated by school and residence in unsanitary houses. M. Vidal, Vice-President of the Society of Public Medicine of Paris, thanked M. Varrentrap for his very interesting report. M. Mullendorf, Secretary of the Genevese Committee, gave the following results of increase of weight after twenty-two days holidays: Boys, 1 kilogramme 722 gr mmes; girls, 950 grammes, in 1881; in 1882, boys, 625 grammes; girls, 800 grammes. If the usual normal increase of weight during a year is correctly fixed at 2 kil. 500 grammes, the

increase for twenty-two days would be 135 grammes. The boys, then, would, in 1882, have exceeded four times and a half, and the girls six times and a half, the normal augmentation. An important element in the organization of these colonies is the expense. Acquired experience has permitted our committee to reduce progressively the net cost of each child. There was spent, everything included, for each child per day, in 1879, 2 francs 55 centimes; in 1880, 2 francs 16 centimes; in 1881, 1 franc 95 centimes, and in 1882, 1 franc 52 centimes. The system we adopted whenever possible was to distribute the members of the school colony among a few families of the same village, a master or mistress being charged with the exercise of a general superintendence over these small groups, and to reunite them after each meal, for walking, games, or employment in common. The unity of the colony was thus sufficiently preserved, and the price of board in agricultural families was greatly reduced, the food being principally tho produce of the soil tilled, and the supplement not greatly to their debit. M. Lubelski related in a few words what had been done in that respect in Poland, particularly at Warsaw. In March 1882, M. Markiewiez, a physician in Warsaw, and a justly esteemed hygienist, organized a committee of persons enlisted in the work. He published a pamphlet which was sold for the profit of the undertaking, and thus sufficiently enlisted the sympathies of the public that, in the month of June, 1882, he was enabled to despatch the first group of young travellers, in number, fifty-four—thirty-two boys and twenty-two girls, aged from eight to thirteen years. They were principally the children of workmen and clerks, asylum and primary school pupils, some rickety and scrofulous. Two female and three male superintendents accompanied, each, a group of from ten to twelve travellers, who remained for thirty days in the country. We record with pleasure the hospitality accorded gratuitously to the young people by numerous landed proprietors; also, the kindness of the railroad directors who all, with the exception of the Grand Trunk line from Warsaw to St. Petersburg, granted free tickets. The public gave large gifts of money and clothes, and everything required was sold at a large discount. A committee of twenty-five charged themselves with visiting the children at the time of their departure; others devoted to them the most careful attention during their sojourn in the country. The superintendents received hygienic and pedagogic rules, and were required to present reports. The return of the children was hailed with great public sympathy. They had a healthy look, and their weight had increased from 600 to 2,800 grammes. The expenses, without counting what had been supplied by generous benefactors, amounted to about fifteen hundred roubles—at the rate of exchange, about 3,800 francs. The last word on this question would be, perhaps, to transform all school children of large cities into school colonies, which would very sensibly diminish the difficulties of school hygiene.

ARTICLE IV.

FIRST ANNUAL REPORT OF THE LOCAL BOARD OF HEALTH OF PARKDALE.

Office Treasurer and Clerk,
PARKDALE, DECEMBER 7th, 1883.

DR. BRYCE,
Secretary Provincial Board of Health, Toronto.

Dear Sir,—Herewith I have the honour to forward you a copy of the first annual Report of the Board of Health of this Municipality.

Your obedient Servant,
W. WALKER,
Village Clerk.

To the Council of the Corporation of Parkdale:

Gentlemen,—I have the honour to present herewith the "First Annual Report" of the Parkdale Board of Health, accompanied by the Report of the Medical Health officer.

The Board is of the opinion that the dissemination of the sanitary information contained in the report of the Medical Health Officer will be conducive to the maintenance of the health of the residents in the "flowery suburbs."

The Board is also of the opinion that the sewers already constructed in the village only require to be utilized by the property owners to become a perfect system, and would herefore respectfully urge upon the Council the desirability of using every legitimate means at their disposal to compel the drainage, when practicable, of lots that are occupied.

The Board, having in view the excellent supply of pure water from the lake, deems it advisable to warn the householders of the village of the constant source of danger their families are exposed to while depending on wells for a supply of water.

"Water from wells is almost universally impure, because a well, no matter how carefully curbed, is in fact a reservoir into which poisonous matter may filtrate through any depth of earth ; and the poison in cess-pools, privy vaults, or any decaying animal or vegetable matter on the surface of the ground adjacent to the well, is pretty sure to find its way into the water of the well."

The widely prevalent notion that the earth will remove all impurities of water which drains through it, is not only false, but mischievous. Dr. Oldright gives us an example of this, in the so-called "filtering basin" dug in the sand of Toronto Island, which had, after a time, rendered the comparatively pure water of the lake, passing through it, so impure that the basin had to be abandoned.

The broad and comprehensive system of sewerage and water supply adopted and successfully carried out by the municipality of Parkdale, is bearing fruit in a vigorous and healthy population. And a more than average degree of education and refinement induced, a wise expenditure to provide for the rising generation a Model School, with every sanitary requirement suggested by the advanced scientific knowledge of this progressive age.

This Board would respectfully suggest to the Council of the Village of Parkdale the necessity of extending their system of drainage as speedily as possible. Also, that the Council introduce a by-law to compel all residents and property holders on such streets as the water mains are laid on, to put in water services, and so do away with "wells," which are, to a great extent, a source of sickness. And that no new building shall be allowed to be erected without being properly drained, and the water service laid on. On such streets where the Water Works system has not been extended, By-Law No. 152, Clause 12, Rule No. 11, which reads as follows, shall be strictly enforced :

"All wells in this municipality shall be cleaned out before the first day of July, in "each year, and any person or persons neglecting the same, shall be liable to the fines "and penalties imposed by Section 13 of this By-Law."

This Board would also recommend to the Council, the urgent necessity of passing a

by-law to compel all property owners on streets where the drainage system has been extended, to connect all privy vaults, etc., with the sewer by the first of May, 1884.

The Board of Health begs to call the attention of the Council to the condition of the drains in rear of the houses corner of Queen Street and Brockton Road, which, at present, are in a very bad state, and it is necessary for the health of the residents in this locality, that immediate action action be taken. The lane in the rear of said houses is very low and badly needs grading, as surface water is continually lodging on it. This should be attended to without delay.

This Board would respectfully request the Council (as the year is now so far advanced) to continue the same method for the removal of garbage that at present exists, and that no alteration be made in the present arrangement until the end of the year.

This Board also request the medical gentlemen of the village to report to the Local Board of Health any sickness that may come under their notice from time to time, which they consider is occasioned by bad or defective drainage.

All of which is respectfully submitted.

John Gray, *Chairman Parkdale Board of Health.*
Chas. F. Mansell, *Secretary.*

Board of Health Report.

Parkdale, Nov. 14, 1883.

To the Chairman and Members of the Parkdale Board of Health:

Gentlemen,—In congratulating the municipality on the formation of a local Board of Health, agreeably to the desire of the Provincial Board, I am of the opinion that to facilitate their labours, and render the necessary duties of each member as light as possible, the report of the sanitary condition of the village from the Medical Health Officer requested by you, will be opportune. I therefore beg to lay before you a statement of my experiences and impressions for the past twelve months.

Although the supervision of the sanitary arrangements has not once been neglected by the Health Committee of the Corporation, still the matter is of too vital importance in a rapidly growing community like our own, to be entrusted to any but a specially appointed Board, whose known activity and vigilance will stimulate a feeling of confidence and emulation.

Physicians, as a rule, have their attention more frequently and forcibly called to the evil results of a bad sanitary condition of the people; hence they are usually the foremost in urging proper legislation for the preservation of Health. In Parkdale the representatives of the inhabitants in the Council have been ever mindful of the growing wants of a growing population, and, as necessity demanded have provided the means of preventing the spread of ill health and disease. Foremost among the many improvements in the past couple of years, is the system of sewerage, which I must unhesitatingly say is, for the portion of the village furnished with it, perfect, but the good work is not complete, and I trust before another year has expired the entire population will be benefited in this manner. During the year, I have been frequently called upon to inspect the condition of low-lying lots in various parts of the village, and in most cases have found large accumulations of water, which have become stagnant, and consequently dangerous to a degree. In cases where the lot was situated close to the line of sewer, the council has exercised its prerogative, and ordered the immediate drainage of the land by the owner, but where the places complained of were at inconvenient distances from the drain, the authorities were powerless, and the nuisance was, of necessity, allowed to stand, to the danger of those residing in its vicinity. Such a condition of things is deplorable, particularly when it has been demonstrated that to such a source has been traced the beginning of consumption. Surface accumulations of water are not only inconvenient and unsightly, but are also disagreeable and unhealthy. Sub-soil dampness makes the site of any habitation incompatible with comfort and duration of life. Therefore, the first care in the preparation of the abodes of man should be the drainage of the soil. It is to be feared, too, that under

neath some of the houses of the village there is, if not collections of water, a certain chronic dampness that is surely fraught with untold danger to many persons unconscious of its proximity. Disease of almost any kind may be traced to this source, and I would warn heads of families to look well to this matter, and make the exclusion of dampness their first and most important household duty. Removal of water from beneath and around the house and out-buildings increases warmth, fertility and wholesomeness. What is true in this respect of an isolated habitation, is true also of collections of habitations in the village. The water supply of Parkdale is a possession of which the villagers may be justly proud, and the source from which it is taken could not well be improved upon; but, I may be permitted to venture an opinion on a matter on which other, and, perhaps, wiser men have legislated: I would say that the taking of water from this supply should have been made compulsory. This course has been adopted in hundreds of towns and villages where our system has been tried and found to work with good effect, because scores of people, who rely on what they consider a "splendid" well will postpone patronising the "water works" until their own supply is exhausted. It is a well-known fact that sickness may be caused by drinking bad water, and as really "pure water is never found in nature," the next thing to do is to secure the best we can. Wells at any time, and particularly in thickly populated places, are always polluted. The porous earth is constantly absorbing an amount of filth that, if explained at length, would horrify those at present in ignorance of the fact, and this is continually soaking into the "splendid" wells which supply the drinking water to hundreds of our people. The first annual Report of the Provincial Board of Health says:—"Well waters may be bright, cool and sparkling, and yet highly dangerous, from the presence of the products of decomposing nitrogenous matter, and frequently from the presence of specific germs that may have filtered from neighbouring privies. Under the microscope water containing sewage discloses the presence of *bacteria* and *infusoria*, the frequent cause of bowel complaints, typhoid and other diseases. The notion that water filtering through the earth renders it pure is an erroneous one, therefore I would recommend that every householder abandon the well, which he has hitherto looked upon as good, and secure the lake water in its stead.

An important matter, and one that should in no case be overlooked, is the removal of excreta. True, a number of our residents have complied with the by-law and adopted the earth closet; many others, since the introduction of the water system, have constructed the water closet; but in too many cases the old style privy pit is used, and nothing is a greater hindrance to sanitary perfection than this.

I have, in some instances, been called to inspect neglected places of this kind, which if not attended to, would have proved a fruitful source of unhealthiness. How many similar nuisances exist, I cannot tell, nor of course can any idea be formed without a systematic tour of inspection by a careful municipal officer, whose duty it would be to report such cases. In a large community especially, neglect in this matter to my mind is criminal. The subject is one that might be enlarged on to the extent of a volume, and in this connection I cannot do better than refer you to the accompanying pamphlet, No. 11, issued by the Provincial Board of Health, which deals with this important subject in an exhaustive manner, and will more clearly explain it than could I, in the limit of an ordinary report.

The disposal of garbage is a matter that every householder should be interested in, and although steps have been taken to meet the wishes of residents in this respect, the system, in a sanitary point of view, is not perfect by any means. A scavenger cart is hired to visit portions of the village once a week, and parties interested are notified to have their week's accumulation in readiness. It will be interesting to know how many do this. As a matter of fact, there are plenty who use the lot in the rear of their residences as a dumping ground, and some of these places are in a disgraceful condition. I would strongly recommend that the cart be constantly employed in this service, and that the sanitary inspector, already suggested, be empowered to enforce the provisions of the By-Law.

The conditions of the lanes is a matter that has frequently come under my notice. Some of them are dirty, and many of them low, permitting water to lodge in wet weather. I would suggest that they get a thorough cleaning this winter, and, where practicable,

that they be raised to a proper level. The beautiful natural situation of our village, combined with the precautionary steps taken by the Municipal authorities, has rendered anything like contagion a stranger to us. Solitary cases have been reported, at rare intervals, but in no instance has the infection spread. Parkdale possesses a splendid school system, and where some five hundred children gather daily, it speaks volumes for the care and vigilance of the Head master and teachers that cases of infection have hitherto been excluded. However, it would be well to insure that in cases where contagious disease has existed in a family, the children of such, before re-admission to the school, should present a medical certificate to the effect that no danger is to be feared.

In many cities and towns a properly qualified person is employed by the Board of Health, to examine all buildings for the purpose of ascertaining whether the plumbing, sewering and draining are carried out in comformity with health and sanitary laws. This I consider a good thing, as at present our responsibility ends with the street line. A housekeeper can employ any person to do the inside work, and that person may be a botch, whose imperfect workmanship might sow the seed of disease in our midst.

On some of the streets, and particularly Queen street, there are a number of depressions which are in a chronic state of mud, the exhalations from which, owing to manure and other fetid matter being allowed to remain are highly dangerous. This might be attended to by the officer appointed for that purpose.

In the rear of the block of houses at the corner of Queen street and Brockton Road is a low lying lane, which is used by the tenants as a deposit for manure, slop water, etc., and which, if not attended to immediately, may be the source of untold misery. The yards attached to those houses are in a deplorable condition also, owing chiefly, I believe, to a defective drain. The remedy for this evil is apparent, and my reason for singling this place out for particular mention is that it may recommend itself to the Board for immediate action.

Numerous cases have been reported to me time and again of nuisances to be removed, or dangerous places to be inspected, but as my duties have to a large extent been hampered by what may be considered an unwise precaution, I have only been able to visit officially those places where I have been sent. Freedom of action in a medical health officer must commend itself to any unbiased and right thinking man, where so important a charge is confided to him.

I cannot conclude this report without paying a tribute of thanks to Mr. Kinzinger, the village commissioner, who has never failed to give me all the assistance in his power, and whose accurate knowledge of persons and locality I have found invaluable. Should, at any future time, the council in their wisdom deem it prudent to appoint a sanitary inspector, a necessary officer now, I would unhesitatingly beg respectfully to request the Board to recommend him for it.

All of which is respectfully submitted.

G. G. Rowe, M.D.,
Medical Health Officer.

Article V.

REPORT OF THE DELEGATES TO THE LATE MEETING OF THE AMERICAN PUBLIC HEALTH ASSOCIATION AT DETROIT.

To the Members of the Provincial Board of Health:

Gentlemen,—Inasmuch as the Report of the transactions of the American Public Health Association will so soon be published, and a full account of the recent meeting will thus be in your hands, it does not seem necessary or advisable that your Delegates should give any lengthened report of the papers and discussions, or do more in this connection than refer briefly to the several groups of subjects taken up.

Amongst the first of these was one which we have not heard so fully entered into elsewhere, viz.: Diseases of Cattle. Besides the papers on Texas cattle fever and swine plague, by gentlemen connected with the United States Army and with the Department of Agriculture and other Bureaus, there was a report upon a matter which had recently presented itself not far west of our own borders, the occurrence of a few cases of a comparatively new affection, vulgarly termed "Swell-head," by which cattle are affected. The most interesting part of these discussions to your Delegates was that which related to the effects of the various diseases referred to on human beings, by their spread to the latter either from the living animals or from diseased meat.

Another group to which great interest must always attach embraces the various papers and discussions on the disposal of sewage. One of the papers in this group, namely, that "On the Overhead Ventilation of Sewers," read by Dr. Oldright, is herewith respectfully presented. In the discussion on this subject Col. Waring, although he feels enthusiastic as to the results in regard to the gaseous contents of sewers which should follow the proper construction of sewers on the separate system, and asserted that there need, in the separate system, be no special provision for the ventilation of sewers, other than that which the simple extension upwards of the soil pipe will give, and which, by the way, is itself an overhead ventilation; still he held, with the reader of the paper, that when special ventilation is necessary, as it is in old and faulty systems and in the combined systems in general, it should be overhead by some such plan as that proposed. No one was found to defend the ventilation of sewers on the level of the road-bed.

Another interesting group was that of papers on Malaria, and subjects connected with it. Of these papers there were very many: Several of them were by eminent army surgeons; and the observations which their opportunities have enabled them to make are of extreme value. Some very curious and interesting points were brought forward in the discussions. Your Delegates could not fail to be deeply interested in a subject of such general interest to scientific men of the day, and to which the attention of this Board has been so fully directed in connection with the investigation conducted last year by Dr. Cassidy and the Secretary, and which has again been occupying a fair share of our attention, through the labours of the latter gentleman, and through some of the papers read at the London Convention: namely, that on Malaria, by Dr. J. L. Bray, on "The London Floods and their Results," by Dr. Waugh, and on "Mill Dams and their Influence on Health," by Dr. Arnott.

Other interesting papers were read on insanity and other forms of disease from the standpoint of their relation to public health, on vital statistics, on foods and their adulterations, on physical training and culture, on State Boards of Health, on school hygiene, and on hygiene in general. Amongst these last may be included the able and eloquent address of the President, Dr. Ezra M. Hunt.

Your Delegates feel that the profit to be derived from attendance at such meetings is by no means confined to the hearing of papers and the discussions upon them, nor to the opportunity that is given to those attending of introducing into the discussion points upon which they may be desirous of obtaining the opinions of eminent men; but that in addition to this there are opportunities for private conversation with these men, and for an interchange of views, and a comparing of notes, on practical points of every-day work,

which are very much to be prized. Furthermore, the return visits of these gentlemen to meetings amongst our own people are a valuable assistance and support in carrying on sanitary work in the Province. As an example of this we may point to the return visit of Dr. Ezra M. Hunt, Dr. Hazlewood, Dr. H. B. Baker, Mr. J. K. Allen and others, to our Convention at London, an account of which will be presented by the Associate Committee of this Board in charge of that Convention.

By the hospitality of the medical men and other citizens of Detroit, an evening reception was held, and an opportunity thus given of meeting and conversing with any and all of the prominent sanitarians in attendance at the meeting of the Association.

Your Delegates take this opportunity of expressing their thanks to the citizens of Detroit for various acts of hospitality, amongst which they would make an acknowledgement of the very great personal kindness shown to a member of your delegation by Levi L. Barbour, Esq., of the State Board of Corrections and Charities.

Your Delegates feel sure that in making personal allusion to, and expressing their pleasure at meeting, certain gentlemen whom they had not previously met for many years, they will be joined by those members of this Board who cherish in their hearts warm recollections of these gentlemen in their student days. We refer to Dr. Adrian Hudson of the United States Navy, and Dr. Chas. Douglas of Detroit.

Other friends and fellow students from various parts of this Province were also present to share in the proceedings.

All of which is respectfully submitted.

WM. OLDRIGHT.
PETER H. BRYCE.

THE OVERHEAD VENTILATION OF SEWERS.

BY WM. OLDRIGHT, M.A., M.D., OF TORONTO, CHAIRMAN OF THE PROVINCIAL BOARD OF HEALTH OF ONTARIO.

Read before the American Public Health Association at Detroit, Michigan, Nov. 13-17, 1883.

The object of the brief paper which I am about to read is to obtain a consideration by this Association of the question whether it is preferable to discharge sewer-gases, as is now done in many of our cities, into our streets on the ground level, amongst wayfarers, who are continually passing over the street ventilators and on all sides of them, or to discharge them at points above the tops of our houses; and in considering it we must bear in mind that in the latter case the gases are to be distributed through a large number of outlets at short distances apart, whereas in the former they are discharged through openings few and far between, and are, therefore, much more concentrated and injurious.

Let us leave out of consideration all side-issues, which, though germane to the subject, have no more bearing on one side than on the other of the particular question proposed. I know some will say: "Attack the main cause of trouble, the existence of decomposing matters in sewers." So we should; but there still remain gases in sewers, and the question now before us is, What shall we do with them? The numerous defects to be met with in house plumbing, and the means for preventing sewer-gases from passing into our abodes, through the drain-connections, have a very important relation to our subject; but, as these have been fully treated by various members of this Association, and I have recently expressed my views on them in an address reported in the annual report of the State Board of Health of Michigan for 1882, and more fully in the latter half of a pamphlet on "The Disposal of Sewage," published a short time ago by the Provincial Board of Health of Ontario, I do not intend to take them up at the present time, for it will be readily admitted by all that, so far as the interiors of our houses are concerned, the plan which should be adopted is that which will secure the greatest immunity from the presence in drains inside of houses of noxious gases in concentrated form.

Let us then address ourselves to the consideration of the question whether sewer-gases should discharge at the level of the road-bed, or into the air above the roofs of the houses. I do not think it will be necessary to spend time in impressing upon such an assemblage as this the fact that to inhale the gaseous contents of sewers is not conducive to health. Even if a system of sewerage be so well constructed that the sewage is removed from it, (changed), every twenty-four hours, I do not think we can say there is no danger from inhalation of gases from the excrementitious products and washings of persons ill with infectious diseases. I may, however, call to the attention of some who may not have noticed it, a report by Mr. Sedgwick Saunders, published some time ago in *The Lancet.* He attributes to sewer-gas, arising from the ventilators in the road-bed in some of the narrow streets of London, cases of typhoid fever and sore throats, and he "suggests an abatement of the evil by the closing of the street ventilating-gratings entirely and the erection of upright shafts, six inches in diameter, to be carried above the roofs of the adjacent houses." I am sure that it has occurred to many of us to notice the disagreeable odours that sometimes arise from the street gratings or from the unsealed traps of gullies. Sometimes, too, we are more than usually impressed with the reality of the exhalation of sewer-gas by the sight of columns of vapour arising from these gratings and gullies and rendered more visible by the condition of the atmosphere on a cold damp day; but we should bear in mind that gases proceed from the sewers even when they are not apparent to sight or smell, and that they are often accompanied by germs.

Some speak of the placing of charcoal-trays in the ventilators as a sufficient safeguard. Even were the charcoal constantly dry, sewer-gas at times makes its exit too rapidly for the charcoal to exert any action upon it. So that, however useful an adjunct charcoal may be, it cannot be considered a preventive to the injurious effects of sewer-gas.

But even were there no objection to the method of ventilating by gratings in the road-bed it is not to be relied upon in winter time. The gratings become clogged or closed by ice and frozen mud.

Hence, it seems evident to me that the principle which is now being advised and adopted by leading sanitarians and architects for the safety of the individual householder in regard to his house-drain ought to be advised and adopted by sanitarians and engineers for the safety of the whole community in regard to the street sewers. A four-inch pipe (C) should be carried from every house drain to the roof of the house which the drain is intended to serve, and should discharge the sewer-gas at a sufficient distance from all chimneys, windows, doors, or other openings into the house. Between this pipe and the sewer no trap should intervene. It would, in my opinion, be better to have a trap between the pipe and the house, provided that, in addition to the extension upwards from the soil-pipe (A), there is another four-inch pipe (B) forming a counter opening and allowing a current of air to circulate freely through the house-drain and its connections and vents, as described in the pamphlet before referred to and illustrated in the accompanying diagram.

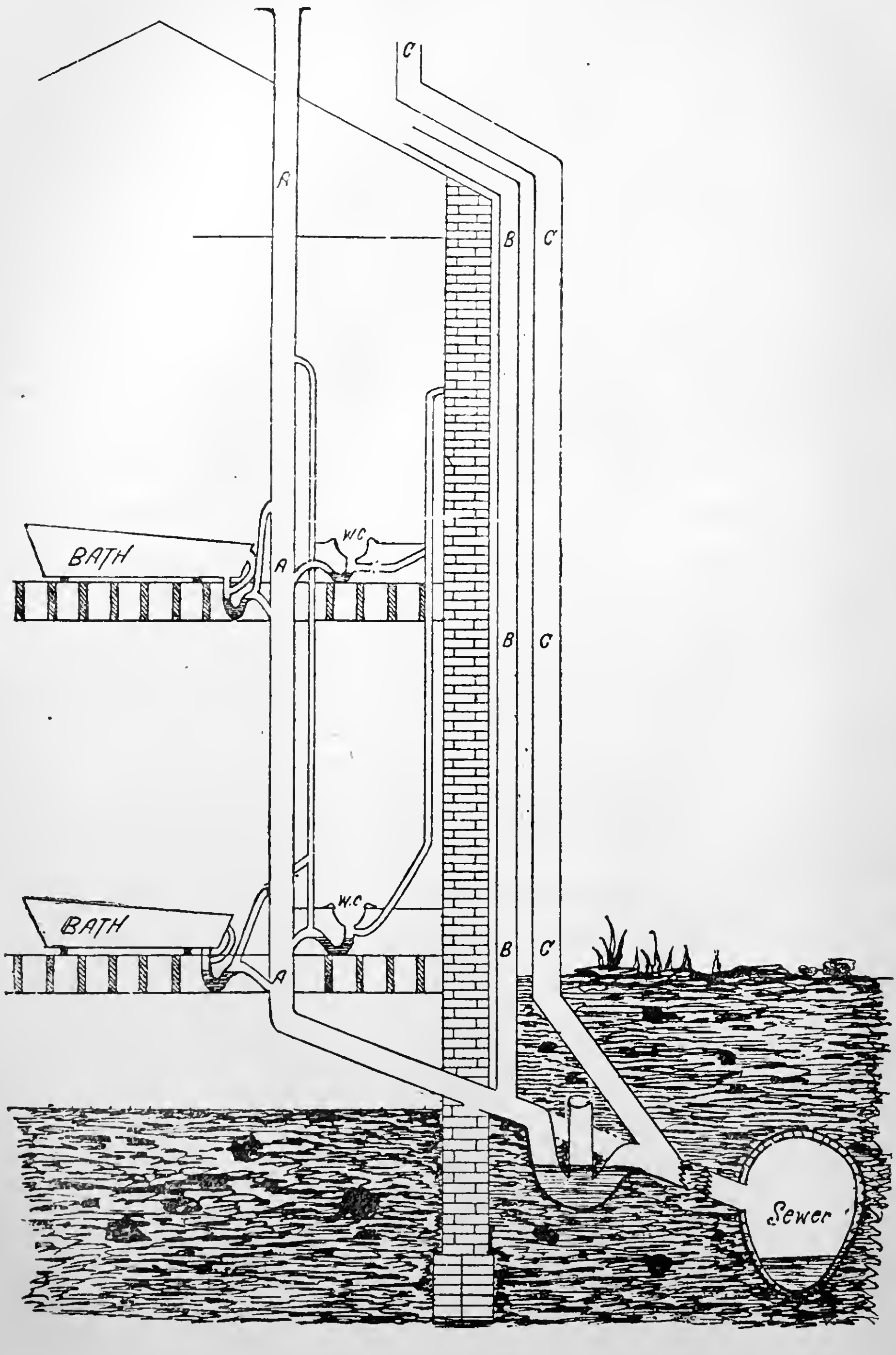
If the health authorities do not wish to risk the odium of thus forcing good health upon the house-holders at once, they ought, at the expense of the corporation, to place pipes at distances proportionate to the spaces measured off by the sewer-gratings, and pass a by-law requiring that a pipe shall be connected with every new drain, and every drain that shall require to be re-opened, and that within a reasonable time all drains shall be provided with them.

The desirability of some such method of disposing of the gaseous contents of sewers seems so apparent that we feel as though we should call upon municipal authorities to show cause why they do not adopt it (if we may borrow a phrase from the courts of law). Let us examine some of the pleas entered in opposition to the proposed reform.

1. One objection I have heard made by some civil engineers is that, inasmuch as house-drains do not usually enter the sewer at the highest point of the latter, there is a space in the crown of the street sewer that cannot be ventilated through the house-drain when the water in the sewer is higher than the mouth of the drain.

To this I would answer that as there is nobody in the crown of the sewer to be

injured it would seem as though nobody need care whether there is confined air there or not; if the pressure becomes very great the gases will be dislodged and will bubble off at a point higher up the line of sewers, where the drains are not water-locked and



where they will find an escape. Most sewers allow for fluctuation of their contents, and it is only at times that the house-drains will be so full as not to allow of counter-currents and through-drafts.

But the ground of this objection furnishes a very strong argument for the overhead ventilation through house-drains; for, when the water closes the mouth of the house-drain, and then rises higher in the house-drain, (as well as in the sewer), what is to become of the gas imprisoned in the drain itself, if there be no vent between the sewer and the traps, the pressure being such as will force the latter? We know that a three-inch seal only offers a resistance of a quarter of a pound for each square inch of surface. The answer to this first objection is partly the answer to the second.

2. The second objection to which I shall refer is that it is not safe to carry sewer-gas through a pipe in such close proximity to the walls of a house, lest some of the gas might escape from the pipe.

(*a*) It is surely safer to have it pass through a pipe outside the house than to have it forced in undiluted form into a pipe inside the house.

(*b*) It must be remembered that, with the present system of half-clogged and infrequent openings, the contents are much more concentrated.

(*c*) In further answer to this objection, I would add that the lower part of the pipe, from the drain to a point a few feet above the ground, should be of cast-iron dipped when hot into melted pitch, and above that, of galvanized iron, which, with a good coat of paint, will remain perfectly tight. But, even if a pin-hole exist here and there, what will that amount to in comparison with the volumes of gas wafted toward the unfortunate houses which happen to be situated opposite a street grating or untrapped gully?

3. Another objection made is that air will not enter the sewers down the long stand-pipes.

(*a*) Now I would again answer that so long as the gas, when it does move, moves off overhead, we need not so very much mind its remaining in the sewer for awhile.

(*b*) But, as a matter of fact, a careful consideration of pneumatic laws and of the forces acting in sewers will show that the objection does not hold. The columns of gas or air on opposite sides of the street, if they are of the same temperature and density, will counterbalance each other; but let the sun shine on one side and immediately an ascensional action begins; or let a cold wind blow on the other and a dense column begins to descend.

(*c*) Besides, the rising and falling of the liquid in the sewer will cause the gas to be expelled, or the air to be drawn in.

(*d*) Again, the air will blow up the sewers from their mouths; and, for this reason, flaps should never be placed on the mouths,—free vents being made all along the course of the sewer.

(*e*) The plea that the gratings are needed for inlets is met by the fact that we so often find them exhaling gases.

So far for objections. I need not refer to the various contrivances for propelling air into sewers and extracting gases from them, such as fans, pumps, steam-jets, and furnace chimneys. They are costly and, alone, are insufficient and unsatisfactory. When plenty of free vents and good traps exist they are unnecessary, and when these do not exist they are dangerous, inasmuch as such propulsion will force traps, and such extraction will empty them by suction where free vents do not exist.

The true plan seems to be to make plenty of breathing-holes, plenty of channels through which currents will continually pass, and which will discharge gases at a safe distance overhead.

I find that, in many of our larger cities, sewer ventilation is quite insufficient and faulty. I find, too, that much apathy—or rather a want of appreciation of correct principles—is found in regard thereto, even among men who are earnest and well versed in matters of sanitation generally. I have therefore thought it a subject which should receive consideration at this meeting.

Article VI.

REMARKS ON THE DISPOSAL OF SEWAGE, TORONTO ISLAND.

The following is the substance of remarks on the above subject made by the Chairman in introducing some of the business to be taken up by the Board at one of its meetings :—

The disposal of sewage on Toronto Island is a subject which must before long demand serious consideration. People are apt to look upon that collection of sand as they would upon an inland sandy region, and to consider that it is an excellent place on which to dispose of sewage. Such an inland region is capable of absorbing a vast amount of refuse, solid and liquid, holding near the surface only so much, and hardly so much, as can be utilized by vegetation, the rest being washed down into the subjacent soil. But on our Island this subsoil is wanting. At any part of it, after going down a very short distance we come to the level of the Lake. The sewage sinks imperfectly this short distance in the wet sand and then spreads laterally, the island being like a large sponge, the top of which projects upwards a short distance above the surface of the water.

The smallest part of the difficulty will occur in connection with the solid refuse, excreta, etc. After a short time people will become convinced of the desirability and necessity of adopting earth-closets and ash-closets, burning kitchen refuse, and resorting to the various methods described in the first part of the pamphlet "On the Disposal of Sewage," issued by this Board. At the present time many of the privies are disgusting cesspools ; some of them are situated over, and in, lagoons, rendering filthy, disgusting, and abominable the waters of these lagoons. This condition we may soon hope to see remedied by the better sense of the inhabitants of the Island supporting such action as we expect will be inaugurated by the Health Committee or Local Board of Health of Toronto.

A more troublesome problem will be the method of getting rid of the liquid sewage —kitchen and bedroom slops. In the vicinity of the kitchens attached to hotels and eating-houses this is already beginning to be felt. The attempt has been made to convey the slops off by means of drains. The slops forced to the termination of the drain spread laterally, as before described, converting the neighbourhood into a filthy bog covered with a few inches of sand. The same occurs when the slops are thrown out upon the sand. One trouble will be that in many cases this condition will be produced slowly, and will not be noticed until it has become difficult to counteract the effects. We are not prepared now to submit any detailed or definite recommendations as to the mode in which the question must be decided. Many subsidiary questions must be considered in connection with the matter. One plan that has suggested itself is the construction of a large tight tank or tanks, into which the liquid sewage may be run, and in which it may be treated by some of the processes employed in other countries, chiefly in England,—the supernatant portion being then pumped off.

The difficulties which will arise in the laying of drains from bad foundation and other causes need only be alluded to ; they are almost self-apparent.

The object in referring to the subject now is that we may be considering it and taking observations so as to be ready for the question in the near future.

In connection with Dr. Oldright's remarks, reference was made, by Dr. Cassidy and other members of the Board, to the disposal on the Island of refuse taken over in scows from the city. It was observed that in addition to the street scrapings, (which contain a good deal of earth), and ashes, large quantities of decomposing and decomposable organic matter are taken over. It was also pointed out that the same occurred in many parts of the city, wharves, streets, and building lots being formed in that way ; and also that the calamitous epidemic of Yellow Fever, which occurred in Memphis a few years ago, owed much of its virulence and magnitude to similar procedure.

It was then moved by Dr. Cassidy, seconded by Dr. Yeomans, and carried : That the report of the Chairman on the Disposal of Sewage, and concerning the contemplated system of sewerage for Toronto and the Island, be referred to the Committee on the Disposal of Sewage.

The following motion was also carried :—

The Board, having learned that garbage, *i.e.* street scrapings and other offensive materials, are being removed from the city to the Island opposite for the purpose of making soil, would earnestly recommend to the proper authorities that, previous to removal, these materials should be effectually deodorized and disinfected.

Article VII.

REPORT OF THE DELEGATES FROM THE PROVINCIAL BOARD OF HEALTH TO THE CANADIAN SANITARY ASSOCIATION.

Your Committee arrived in Kingston on the morning of the 5th September, and in the evening of that day a meeting of medical men and others interested in sanitary science, including Mr. N. F. Boxer, Secretary, was held.

The first point considered by the meeting was the character which the Association about to be organized should take, and what were to be its objects. It was decided that it must be a voluntary, non-official Association, and that its objects should be to investigate and discuss various problems of sanitary science, to extend and diffuse sanitary knowledge, and, by its experience, to aid existing or future organizations in the execution of their work. One feature, considered desirable by Mr. Boxer, was, that members of the Association should form Local Sanitary Societies for the purpose of advancing sanitary objects in their respective localities.

At this meeting it was recommended that the constitution, as formerly prepared in one of the prospectuses, be simplified by having no distinctive classification of members of the Association, and by having only one Council—the Executive Council.

A number of Committees were also agreed upon, the work being divided amongst them much in the same manner as amongst the Committees of your Board.

The following summary of the proceedings is extracted from a copy of the minutes furnished your Committee by the Secretary, Mr. Boxer :—

Proceedings of a Meeting of the Canada Medical Association and laymen, at Kingston, on the 7th September, for the purpose of organizing a Canadian Sanitary Association, in accordance with resolutions passed at a meeting of the Members of the Health Conference, held at Ottawa, on the 5th December, 1882.

Queen's College, Kingston, 7th September, 1883.

Dr. E. Playter, Chairman of the Provisional Committee, addressed the meeting, and called upon Mr. F. N. Boxer, Provisional Secretary, to read his report.

The report having been read, it was moved and carried,

That Dr. Sweetland, of Ottawa, be the President for the first year.

The following physicians were then unanimously chosen to be Vice-Presidents, and to hold office during the first year :—

For Ontario—Dr. Chas. W. Covernton, of Toronto.
" Quebec—Dr. F. E. Roy, of Quebec.
" New Brunswick—Dr. LeBaron Botsford, St. John N.B.
" Nova Scotia—Dr. J. N. Macdonald, Londonderry, N. S.
" Manitoba—Dr. D. P. Lynch, Winnipeg, Man.
" Prince Edward Island—Dr. P. Conroy, Charlottetown, P.E.I.
" British Columbia—To be hereafter named.

Moved by Dr. Macdonald, seconded by Dr. Oldright,

That Mr. F. N. Boxer be the Secretary-Treasurer, and that the preliminary expenses incurred by him for printing, postage, &c., in the formation of this Association, be defrayed out of its funds. Carried.

It was moved by Mr. Boxer, and seconded,

That of the Members of the Executive, not members *ex officio*, one half, at least, should be gentlemen outside of the medical profession. Carried.

Moved and seconded,

That the Province of Ontario shall have five Executive Members; Province of Quebec, four Executive Members; Nova Scotia, two; New Brunswick, two. Carried.

The following were then elected to form an Executive for the Province of Ontario:

1. Professor Galbraith, School of Practical Science, Toronto.
2. Professor Carr Harris, Civil Engineer, Military College, Kingston.
3. Dr. W. Oldright, Chairman Provincial Board of Health, Toronto.
4. Dr. James McCammon, Kingston.
5. Rev. Professor Austin, Alma College, St. Thomas.

For the Province of Quebec:

1. Alderman Fairbairn, Board of Health, Montreal.
2. Dr. Rinfret, Quebec
3. Mr. F. Hughes, Sanitary Engineer, Montreal.
4. Dr. A. B. Larocque, Medical Health Officer, Montreal.

For New Brunswick:

1. Dr. Harding, Quarantine Officer, St. John, N.B.
2. ——— ———

For Nova Scotia:

1. Honourable Dr. McNeil Parker, Halifax.
2. Thornbury Shewan, C. E., Antigonish.

The number and names for the other Provinces were not fixed.

Resolved, That the present Executive Committee shall fill up the vacancies now existing, or that may occur during their year of office. It was then moved by Dr. Oldright, seconded by Dr. Roy,

That the Executive Committee be instructed to prepare by-laws for conducting the meetings of the Associatian, and to prepare a list of the standing Committees, defining the duties of the same, and that, with this object in view, the Secretary be instructed to send to each member of the Executive Committee a copy of the constitution adopted this day, and of the other items resolved upon at an informal meeting of the medical men, held on the 5th inst., and that so soon as one hundred members have been duly enrolled, the Executive shall proceed to fill up the standing Committees, which shall report to the Executive Committee six weeks before the next meeting. The Executive Committee to report at the annual meeting. Carried.

Moved by Dr. Larocque, seconded by Dr. Rinfret,

That the question of a Sanitary Journal, to be published under the auspices of the Canadian Sanitary Association, be referred to the Executive Committee, with instructions not to proceed with its publication, until sufficient funds are in the hands of the Treasurer to meet the necessary expenses.

In conclusion, we may say that this Association, judiciously managed, would materially assist in sanitary reform. The members, composed of all classes of the community, would be those who appreciate the benefits of sanitation, and who would find in a Public Health Association a convenient and ready organization for expressing and promulgating principles of sanitary science. Also, it would afford frequent opportunities for exchanging views regarding public health, and, in this way, excite a general interest in all parts of the Dominion.

All which is respectfully submitted.

(Signed), Wm. Oldright,
H. P. Yeomans.

Article VIII.

ACTION TAKEN IN THE TOWN OF PERTH, BY THE TRUSTEES, REGARDING THE INTRODUCTION OF INFECTIOUS DISEASE INTO THE PUBLIC SCHOOLS.

Letter from D. Kellock, M.D.

Perth, May 12th, 1883.

P. H. Bryce, M.A., M.D., etc.

Dear Sir,—By the enclosed [printed slip simply referring to what appears in the letter] you will notice that a difficulty has arisen here with reference to the powers and duties of School Boards and teachers, when diseases of a contagious nature, as scarlatina, appear amongst the families to which the pupils belong. The difficult point is, how the teacher may get prompt information on which he may rely and act. You will notice that one member wished to compel parents to furnish a medical certificate to the teacher, on demand, *at any time*, as to the nature of any illness in the family. This, I think, is wholly impracticable and beyond the power of the Board to exact. The school law gives the teacher the power, as a public officer, to exclude from the school a pupil from a house where there is a contagious disease, and such pupil can only be re-admitted on a proper medical certificate; but the difficulty is as to how the teacher is going to find out the fact of such disease existing and to find it out early. Of course if there were a local Board of Health with a Health Officer to whom medical men required *immediately* to report any and all cases of contagious disease the question would be settled. I am glad to see that the Provincial Board is about to endeavour to obtain the necessary legal enactment for such provision. In the meantime I would like to know whether there is any better or simpler method for us to adopt than just *to ask* the different medical men of the place to report such cases promptly to the head master, or some other party, and to require that strict *isolation* and the observance of every precaution to prevent the spread of scarlet fever and other contagious diseases.

I have the honour to be, dear Sir, your obedient servant,

J. D. Kellock, M.D.

The following answer was sent by the Secretary to Dr. Kellock's most important communication :—

Toronto, May 15th, 1883.

My Dear Sir,—Your letter *re* the interesting matter which has come up in your School Board has been received. Your solution of the difficulty is doubtless the correct one, that a Local Board of Health and a Health Officer should be appointed, to whom all contagious diseases should be reported by physicians. In this case the Health Officer would give the certificate to the pupil and at the same time notify the teacher.

But while this system will, I trust, be adopted everywhere very soon—and I do not see why it should not be at once in Perth—there is at present a remedy which has been here and there carried out, by which the teacher is empowered as follows, (Compendium of School Law, 1878, part iv. cap. 11): "The master of every school shall see that no pupil is admitted to, or continues in, any of the public schools who is affected with or has been exposed to any contagious disease, until all danger of contagion from such pupil or from the disease or exposure shall have passed away as certified in writing by a medical man." You see that there can be no doubt about not only the power of the teacher but that it is a compulsory duty which he must perform. The Board need not pass such a regulation, as it is already an imperative regulation.

The method which has been very successfully carried out in the city schools of Hamilton is for every teacher to immediately enquire as to the cause of absence of any pupil, and if it be found that there is suspicion of contagious disease the certificate of a physi-

cian is required before re-admission to the school is possible. I transmit herewith facsimiles of the cards which the head master sends to every physician. It has, during more than a year, worked very satisfactorily, and the teachers are pleased with results. You will find on page 74, of the annual report sent you, a digest of the laws regulating the formation of Local Boards. Endeavour to get a satisfactory organization completed at once. Trusting to hear from you again as soon as possible,

I remain yours, very sincerely,

J. D. Kellock, M.D., Perth. P. H. Bryce, *Secretary.*

As a result of this correspondence, the following Report of the Meeting of the Perth Board of Education is copied from the Perth *Expositor* :—

Dr. Kellock read the following report of the committee appointed to act in reference to contagious diseases in connection with the schools :—

To the Chairman, etc. :

Gentlemen,—We, your committee appointed to act in reference to contagious diseases in connection with the schools, beg leave to report—

That we addressed a communication upon the subject to Dr. Bryce, of Toronto, Secretary of the Provincial Board of Health, and received from him a very full reply, which is herewith enclosed.

Your committee recommend that the attention of the head masters be at once called to the provisions of the School Law, which enacts that "the Masters of every school shall see that no pupil is admitted to or continues in any of the schools who is affected with or has been exposed to any contagious disease, until all danger of contagion from such pupil or from the disease or exposure shall have passed away, as certified in writing by a medical man," and that in carrying out this enactment, the "Hamilton plan," as explained by Dr. Bryce, be adopted by such masters.

Your committee, however, are of opinion that no really satisfactory scheme for the preservation of the public health and the prevention of the spread of contagious diseases can be carried out without action on the part of the Town Council.

Under the provisions of 45 Vic., Cap. 29, sections 18, 19 and 20, we find that duties are imposed on and penalties can be enforced against householders and physicians who neglect to give notice of the existence of contagious diseases to the local Board of Health.

In view of the importance of the subject, we recommend that the following petition be adopted by your Board :—

To the Mayor, etc. :

Gentlemen,—We, the Board of Education of the town of Perth, having had before us in connection with the schools, the great importance of devising some satisfactory scheme for the preservation of the public health and the prevention of the spread of contagious diseases, and being impressed with the fact that no such scheme can be carried out without your co-operation, beg leave to draw your attention to the provisions of 45 Vic., Cap. 29, sections 18, 19 and 20, and to ask that your Council at once appoint a local Board of Health, with a health officer, whose special duty it should be to see that the provisions of the Act are strictly enforced.

Such health-officer being required to undertake duties which will perhaps in many cases be disagreeable and will in their fulfilment also necessitate considerable loss of time, we are of opinion that a fit and proper officer cannot be expected to act without a remuneration, and that, therefore, a reasonable salary should be attached to the office.

While not for a moment presuming to dictate to your Council, we consider the matter is one which admits not of delay, by reason of the changed character of the town from what it was a year or two ago, and the greatly increased and still increasing population.

All of which is respectfully submitted.

(Signed) Thomas Brooke, *Chairman.*
Chas. Rice, *Secretary.*

Your committee recommend that the said petition be signed by the said Chairman and Secretary, on behalf of the Board, and transmitted by the latter to the Town Council without delay.

All of which is respectfully submitted.

J. L. KELLOCK, *Chairman.*
W. W. BERFORD.
F. A. HALL.

Perth, May 31st, 1883.

The following are the clauses of "The Public Act of 1882," referred to in the above report:—

"Whenever any householder shall know that any person within his family has the small-pox or any other disease dangerous to the public health, he shall immediately give notice thereof to the Local Board of Health, or to the health officers of the municipality in which he resides.

"Whenever any physician shall know that any person whom he is called upon to visit is affected with the small pox or any other disease dangerous to the public health, such physician shall immediately give notice thereof to the Local Board of Health or health officers of the municipality in which such diseased person may be.

"Any person or persons, physician or physicians, to whom the two preceding sections shall apply, who shall refuse or neglect to give the notice by such section required to be given by him or them respectively, shall be subject to the penalties provided by the thirty second section of 'The Act respecting the Public Health, and the said thirty-second section and the subsequent sections of said Act shall apply to any prosecution and proceedings under the said preceding sections.'"

The penalty on householders and physicians refusing or neglecting to give the required notice is $20.

Dr. Kellock said it might seem that the Board was trespassing on the Town Council affairs, but we were all working for the good of the schools, and something should be done. The Board can only carry out the law. A Board of Health should be appointed at once.

The report was adopted.

PERTH, ONT., Dec. 7, 1883.

Dear Sir,—Yours of the 6th inst. received. Allow me to thank you for kind expressions of sympathy at this time, and on other occasions when writing. I have not yet recovered sufficiently to enter upon the active duties of practice, but expect to be able to do so about New Years.

As to the matter to which you refer, the Town Council, on presentation of the memorial from the School Board, duly appointed a Local Board of Health, *wholly consisting of laymen*, and did nothing more, as they did not feel warranted in apportioning any of the funds under their control in paying a health officer. This appointment should be provided for and the salary attached by Act of Parliament, as we find when anything, no matter how important, is merely optional with Councils, it is generally neglected.

The Local Board of Health has done absolutely nothing in matters relating to the public health. Owing to a large influx of population and consequent overcrowding, with neglected precautions as to health, filthy out-premises, contaminated water supply, etc., etc., we have a good deal of fever—happily only one fatal case. Personally, I have been the longest and worst sufferer from the fever.

It is to be hoped that such amendments to the Health Acts as are needed may be made at the coming session of Parliament.

I got Dr. Munro to attend to the weekly returns.

I am, dear sir, yours very truly,
J. D. KELLOCK.

P. H. Bryce, Esq., M.D.

APPENDIX D.

Article I.

BY-LAWS SUGGESTED FOR THE GUIDANCE OF MUNICIPAL COUNCILS IN ESTABLISHING LOCAL BOARDS OF HEALTH.

(Being Pamphlet No. 12, issued by the Provincial Board of Health, July, 1883, on report of Dr. H. P. Yeomans.)

(N.B.—Should the suggestions of the Board in regard to amendments to the Public Health Act be adopted by the Legislature, a Schedule of By-Laws will be recommended containing modifications necessitated by the changes in the law.)

It is hoped that during the ensuing year many new Local Boards of Health will be established. In order to assist in accomplishing this very desirable object, and to meet enquiries, the following proposed By-laws and Rules relating to Public Health are submitted for reference, and attention is also directed to the "Memorandum Concerning the Powers and Duties of Municipal Authorities,"* issued last year by the Provincial Board of Health.

Many Municipal Councils throughout the Province have already adopted some of the clauses recommended in this pamphlet.

It has been thought advisable, however, to frame and distribute a systematic code of regulations in order to secure, if possible, uniformity and efficiency in the method of administering the Public Health Service of the Province.

This code of health regulations may be modified, as deemed necessary in the opinion of municipal authorities, to suit local requirements and to accomplish the desired result.

By-law No. .

A By-law respecting the Public Health.

Whereas it is expedient and necessary for the preservation of the public health to make provision therefor by adopting a series of rules and regulations to be observed by the inhabitants resident within the Municipality of the (*town of*) or other persons owning or occupying lands within the said Municipality.

Be it therefore enacted by the Municipal Council of the Corporation of and it is hereby enacted as follows :—

1. †All the powers and authorities conferred upon or vested in the members of the said Municipal Council by any statute of the Legislature of this Province as Health Officers of the said Municipality shall be vested in and delegated to a Committee of such persons as the Council shall from time to time, by By-law, appoint ; the members of the said Committee to be Health Officers, and the said Committee to be called the Board of Health for the .

2. The Board of Health so constituted shall employ such subordinate officers, agents and assistants as it may deem necessary, and may, subject to the approval of the Council, fix the compensation to be allowed them ; but the whole amount of such compensation shall not exceed the sum appropriated therefor by the Municipal Council.

3. It shall be lawful for the Board of Health, with the concurrence of the Municipal Council, to appoint a Medical Health Officer, to hold office during pleasure for this Municipality [*or* to appoint such officer in conjunction with the Municipalities of and], whose duty it shall be to assist and advise as required by the Board of Health or its officers in matters relating to public health, and to super-

* Article IV., page 74, First Annual Report of the Provincial Board of Health.

† It is recommended that in order to secure the greater efficiency of such Local Boards the method pursued in Great Britain be adopted, namely : that members shall continue in office for three years, one-third of the Board retiring each year. The Committee may be composed in whole or in part of members of the Council, or of persons who are not members hereof.

intend, under the direction of the Board, the enforcement and observance of Health By-laws or Regulations, and, if thought advisable by Boards of School Trustees, to act as Medical Inspector of Public, Separate and High Schools, as well as advisory officer in matters pertaining to school hygiene, and to perform such other duties for the preservation of the public health as may in his opinion be necessary and in accordance with the Public Health Acts. He shall also present to the Local Board of Health before the fifteenth day of November in each year a full and comprehensive report and review of the sanitary condition of the Municipality.

4. It shall be the duty of the Chairman of the Board of Health to present to the Municipal Council before the first day of December in each year a report containing a detailed statement of the work of the Board of Health during the year and the report of the sanitary condition of the Municipality, as rendered to him by the Medical Health Officer. A copy of each such report shall be transmitted by the Clerk of the Municipality to the Secretary of the Provincial Board of Health.

5. It shall not be lawful for any person within the said Municipality to permit or suffer the accumulation upon his premises, or to deposit or permit the deposit upon any lot belonging to him, of anything which may endanger the public health, or to deposit on any public street, square, lane, or on any by-way in front or in rear or alongside of his buildings or premises, or in any pond, creek, river or running stream any manure or other refuse or vegetable or animal matter or any other dirt or filth.

6. It shall be the duty of such person as the Board of Health appoints to perform the duties of Sanitary Inspector, to keep a vigilant supervision over all said lanes, by-ways, lots or premises upon which any such accumulation as aforesaid may be found, and at once to notify the parties who own or occupy such lots or premises, or who either personally or through their employees have deposited such manure, refuse, matter, dirt or filth in any lane or by-way, to cleanse the same and to remove what is found thereon; such parties shall forthwith remove the same, and if the same be not removed within twenty-four hours after such notification, the Inspector may prosecute the parties so offending, and he may also cause the same to be removed at the expense of the person or persons so offending. He shall also inspect at intervals, as directed by the Board, all premises occupied by persons residing within its jurisdiction, and shall report to the Board each and every case of violation of any of the provisions of this By-law, or of any other regulations for the preservation of the public health, and shall also report every case of refusal to permit him to make such inspection.

7. Whenever it shall appear to the Board of Health or any of its officers that it is necessary for the preservation of the public health, or for the abatement of anything dangerous to the public health, or whenever they or he shall have received a notice signed by one or more inhabitant householders of the Municipality stating the condition of any building in the Municipality to be so filthy as to be dangerous to the public health, or that upon any premises in the Municipality there is any foul or offensive ditch, gutter, drain, privy, cesspool, ashpit or cellar kept or constructed so as to be dangerous or injurious to the public health, or that upon any such premises an accumulation of dung, manure, offal, filth, refuse, stagnant water, or other matter or thing is kept so as to be dangerous or injurious as aforesaid, the said Board of Health shall enter or direct the proper officer to enter such buildings or premises for the purpose of examining the same, and, if necessary, the Board or such officer shall order the removal of such matter or thing as aforesaid. If the occupant or proprietor or his lawful agent or representative having charge or control of such premises, after having had twenty-four hours' notice from any such officer of the Board of Health to remove or abate such matter or thing as aforesaid, shall neglect or refuse to remove or abate the same, he shall be subject to the penalties imposed under Section 13 of this By-law.

8. If the Board of Health is satisfied, upon due examination, that a cellar, room, tenement or building within its jurisdiction, occupied as a dwelling-place, has become, by reason of the number of occupants, want of cleanliness, the existence therein of a contagious or infectious disease, or other cause unfit for such purpose, or that it has become a nuisance, or in any way dangerous to the health of the occupants or of the public, they may issue a notice in writing to such occupants, or any of them, requiring the said

premises to be put in a proper sanitary condition, or if they see fit, requiring the occupants to quit the premises within such time as the Board may deem reasonable. If the persons so notified, or any of them, neglect or refuse to comply with the terms of the notice, every person so offending shall be liable to the penalties imposed by Section 13 of this By-law, and the Board may cause the premises to be properly cleansed at the expense of the owners or occupants, or may remove the occupants forcibly and close up the premises, and the same shall not again be occupied as a dwelling-place without the consent, in writing, of the Board.

9. No proprietor or tenant of any shop, house or outhouse, shall, nor shall any butcher or other person, use any such house, shop or outhouse at any time as a slaughter-house or for the purpose of slaughtering any animals therein, unless such shop, house or outhouse be distant not less than two hundred yards from any dwelling-house and distant not less than seventy yards from any public street.

10. All slaughter-houses within the Municipality shall be subject to regular inspection under the direction of the Board of Health ; and no person shall keep any slaughter-house unless the permission, in writing, of the Board of Health for the keeping of such slaughter-house has been first obtained, and remains unrevoked. Such permission shall be granted, after approval of such premises upon inspection, subject to the condition that the said houses shall be so kept as not to impair the health of persons residing in their vicinity, and upon such conditions being broken, the said permission may be revoked by the Board ; and all animals to be slaughtered, and all flesh meat exposed for sale in this Municipality shall be subject to the like inspection.

11. All dairies or other places in which milk is sold or kept for general use, and all cheese-factories and creameries shall be subject to regular inspection under the direction of the Board of Health ; and the proprietors shall be required to obtain permission, in writing, from the Board, to keep such dairy or other place in which milk is sold or kept as aforesaid, or to keep a cheese-factory or creamery, and the same shall not be kept by anyone without such permission, which shall be granted after approval of such premises upon inspection, subject to the condition that all such places as aforesaid are so kept and conducted that the milk shall not contain any matter or thing liable to produce disease, either by reason of adulteration, contamination with sewage, absorption of disease germs, infection of cows, or any other generally recognized cause, and upon such condition being broken the said permission may be revoked by the Board.

12. The following code of Rules and Regulations for the preservation of the public health and the prevention of the spread of contagious or infectious diseases shall constitute a part of this By-law, and any person or persons violating or neglecting any of the said Rules and Regulations shall be liable to the fines and penalties imposed by Section 13 of this By-law :—

Rule 1.—No privy vault, cesspool or reservoir into which a privy, water-closet, stable or sink is drained, except it be water-tight, shall be established unless by special permission of the Board, in which case it shall be not less than one hundred feet from any well, spring or other source of water used for culinary purposes.

Rule 2.—Earth privies or earth closets without a vault below the surface of the ground do not come within Rule 1, but sufficient dry earth, wood-ashes or coal-ashes to absorb all the fluid parts of the deposit must be thrown upon the contents of such earth privies and closets daily, and the entire contents must be removed weekly.

Rule 3.—All privy vaults, cesspools or reservoirs named in Rule 1 shall be cleaned out at least once a year, and from the 15th day of May to the 1st day of November in each year shall be thoroughly disinfected by adding to the contents of the vault, cesspool or reservoir, once a month, not less than two pounds of sulphate of iron dissolved in a pail-ful of water, or other suitable disinfectant.

Rule 4.—Within the limits of this Municipality no night-soil or contents of any cesspool shall be removed unless previously deodorized as above, and during its transportation the material shall be covered with a layer of fresh earth, except the removal shall have been by the "Odorless Excavating Process."

Rule 5.—All putrid and decaying animal or vegetable matter must be removed

from all cellars, buildings, out-buildings and yards, on or before the 15th day of May in each year.

Rule 6.—Every householder and every hotel and restaurant keeper, or other person accumulating garbage shall have a proper covered receptacle for swill and house offal, the contents of which shall, between the 15th day of May and the 1st day of November, be regularly removed as often as twice a week.

Rule 7.—Between the 15th day of May and the 1st day of November no hog shall be kept within the limits of this Municipality, except in pens seventy feet from any house, with floors kept free from standing water and regularly disinfected.

Rule 8.—No animals affected with an infectious or contagious disease shall be brought or kept within this Municipality, except by permission of the Board.

Rule 9.—No person shall offer for sale as food within this Municipality any diseased animal, or any meat, fish, fruit, vegetables, milk, or other article of food, which, by reason of disease, decay, adulteration, impurity, or any other cause, shall be unfit for use.

Rule 10.—The keeper of a livery or other stable shall keep his stable and stable-yard clean, and shall not permit, between the 15th day of May and the 1st day of November, more than two waggon-loads of manure to accumulate in or near the same at any one time, except by permission of the Board of Health.

Rule 11.—All wells in this Municipality shall be cleaned out before the 1st day of July in each year.

Rule 12.—Any householder in whose dwelling there shall occur a case of scarlet fever, diphtheria, small-pox, cholera, typhus or typhoid fever, or other disease dangerous to public health, shall immediately notify the Board of Health of the same, and until instructions are received from the Board, shall not permit any clothing or other property to be removed from his house, nor shall any occupant of the said house change his or her residence to any other place within the municipality without the consent of the Board.

Rule 13.—Whenever there shall come under the observation of any physician a case of cholera, scarlet fever, typhus or typhoid fever, diphtheria, small-pox, or other disease dangerous to public health, he shall at once report the same to the Medical Health Officer.

Rule 14.—No person sick with any of the diseases specified in Rule 12 shall be removed at any time except by permission and under direction of the Board of Health.

Rule 15.—Each and every person affected with any of the diseases specified in Rule 12 shall be immediately separated from all persons liable to contract or communicate the disease, and no one having had access to any person so affected shall mingle with the general public, except such person is an attending physician or clergyman, who shall be required to adopt all needful precautions to prevent the spread of such disease. Nothing shall be permitted to pass from the person so affected to any outside person unless the same shall first have been properly disinfected.

Rule 16.—Persons recovering from any of the diseases specified in Rule 12, and nurses who have been in attendance on any person suffering from any such disease, shall not leave the premises till they have received from the attending physician a certificate that in his opinion they have taken such precautions, as to their persons, clothing, and all other things they propose bringing from the premises, as are necessary to insure the immunity from infection of other persons with whom they may come in contact.

Rule 17.—All persons named in the last preceding Rule are required to adopt for the disinfection and disposal of excreta, and for the disinfection of utensils, bedding, clothing and other things which have been exposed to infection, such measures as have been, or may hereafter be, advised by the Provincial Board of Health or by the Medical Health Officer; or such as may have been recommended by the attending physician as equally efficacious.*

Rule 18.—No person suffering from, or having very recently recovered from, small-pox, diphtheria, scarlet or typhus fever, measles or whooping-cough, shall expose

*Note.—The measures already advised by the Provincial Board of Health may be found in the pamphlet issued by that Board, entitled "How to Check the Spread of Contagious or Infectious Diseases," which pamphlet may be consulted by reference to page 68 of the First Annual Report of the Board. Additional copies of it may be obtained on application to the Secretary.

himself in any conveyance in this Municipality, without having previously notified the owner or person in charge of such conveyance of the fact of his having, or having recently had, such disease.

RULE 19.—The owner or person in charge of any such conveyance must not, after the entry of any so infected person into his conveyance, allow any other person to enter it without having sufficiently disinfected it under the direction of the Board of Health or the supervision of the Sanitary Inspector or Medical Health Officer.

RULE 20.—No person shall transmit, sell or expose, to, from or within this Municipality, any bedding, clothing or other article likely to convey any of the diseases named in Rule 12, without having first taken such precautions as the Board may direct as necessary for removing all danger of communicating any such disease to others.

RULE 21.—No person shall let or hire any house or room in a house in this Municipality, in which house any of the said diseases have recently existed, without having caused such house and the premises used in connection therewith to be disinfected to the satisfaction of the health authorities.

13. Any person who violates Section 7, 8, 9 or 10 of this By-law or Rule 1, 8, 9, 20 or 21 of Section 12, shall be liable for every such offence to a penalty of not less than $5 nor more than $50 in the discretion of the convicting Justices or Magistrate, besides costs, which may also be inflicted if the committing Justices or Magistrate see fit to impose the same. Any person who violates any other provision of this By-law shall, where such violation does not come within the penal provisions of section 32 of the Revised Statutes respecting the public health, be liable for every such offence to a penalty not exceeding $20, in the discretion of the convicting Justices or Magistrate, besides costs, which may also be inflicted if the convicting Justices or Magistrate see fit to impose the same. Every such penalty may be recovered by any person before any two Justices or a Police Magistrate having jurisdiction in the said Municipality, and shall be levied by distress and sale of the goods and chattels of the offender, with the costs of such distress and sale, by warrant under the hands and seals of the Justices, or the hand and seal of the Police Magistrate, before whom the same are recovered, or under the hands and seals of any other two Justices having jurisdiction in the Municipality, and in default of sufficient distress the said Justices or Magistrate may commit the offender to the Common Gaol or to any Lock-up or House of Correction in the said Municipality for any time not exceeding fourteen days unless the amount imposed is sooner paid.

14. By-law No.   of the said Municipality, entitled "   " is hereby repealed.

ARTICLE II.

EXTRACTS FROM THE REPORT OF THE COMMITTEE ON PUBLIC HEALTH, VITAL STATISTICS AND CLIMATOLOGY OF THE ONTARIO MEDICAL ASSOCIATION.

To the President and Members of the Ontario Medical Association:

Gentlemen,—Your Committee on Public Health, Vital Statistics and Climatology beg leave to report as follows :—

During the past year the interest of the people of this Province in sanitary matters has continued to increase. Not only has this been manifest amongst the members of our own profession, ever active to advance the physical welfare of the people, but it has been shown in various other ways: by more frequent paragraphs in the press, by discussions at the meetings of societies, by the conversation of persons with whom members of your Committee have come in contact, by the action of the legislative and governmental bodies—Federal, Provincial and Municipal. Of course there are many of these latter bodies which have not yet aroused from their lethargic attitude as regards matters affecting the lives and health of the community. And there are individuals who assume

to give judgment on subjects regarding which they are ignorant, and who court a cheap popularity by acting as obstructionists of a penny-wise sort. But this does not do away with the noticeable fact that the general tendency is onwards, and that there is a very marked interest at the present time.

Your Committee would urge upon the members of the Association the desirability of seizing upon this opportune time to stir up a still greater interest and to give it a practical shape. No doubt your Committee on Legislation will report to you the additions to sanitary legislation which were recommended to the attention of the Legislature during the last Session of Parliament, and amongst these the proposition to establish a Local Board of Health with its Medical Health Officer in each Municipality or group of Municipalities. We regret to say that it was found impracticable to have these changes adopted in the last Session of an expiring House, but there is little doubt, from the favourable consideration which they received, that if properly supported by you, the most essential of them will be adopted at the next Session of Parliament. It must be quite evident that whatever sanitary improvements may be recommended, either by you as an Association or by the Provincial Board of Health, or by individual members, or from any other source, they cannot put themselves into force, but that there must be somebody specially charged to keep on the alert regarding such matters, and to give them that practical effect and to keep them in operation in that practical way by which alone these beneficial results can be obtained. You must and do know from observation that such functions form but a very small and much neglected part of the mass of business occupying the time and attention of a Municipal Council; and as to shaping and carrying out plans regarding the maintenance of public health in the individual locality, and superintending the details in regard thereto, does not all this require the services of a medical man—a man conversant with the causes and nature of disease and of morbific influences?

That there is pressing need for the services of such an officer in remedying unhealthy conditions must be abundantly manifest to you. Our over-crowded and ill-ventilated schools, factories and other buildings, our disease-breeding ponds and ditches, neglected slaughter-houses and other nuisances, and above all the pestilential contamination of air and drinking-water by the improper modes now so common of disposing excreta, are all reminders well known to you of the good that may, without unnecessary annoyance or interference, be achieved by a judicious Medical Health Officer and Board of Health.

In connection with this last named subject your Committee begs leave to present a few advanced copies or proof-sheets of a pamphlet about to be issued by the Provincial Board, endeavouring to meet, in a practical way, some of the difficulties now existing in connection with it. But how manifold more will be the usefulness of this when we can get in each locality an organization willing, and whose duty it shall be, to work the matter out, and assist householders in regard to it.

Your Committee begs leave, at the same time, to submit a few copies of a circular also about to be issued with the object of obtaining information and awakening interest in connection with Local Boards, and to which it trusts the members of this Association will respond, the more so since the circular deals with some questions upon which you were so desirous of obtaining information that you instructed a former Committee to issue a similar circular. It is further hoped that the whole profession will give to this circular the same general response which you expected would be given to that which you wished to have sent out.

Another subject may be alluded to, and a short and earnest appeal in connection with it may be made through you to the members of the profession. The annual destruction of life amongst those upon whom we set our best hopes and affections—our children—has been a source of deep concern to successive Committees of this Association, and to the Association generally. Your Committee is of opinion that this destruction of children might be prevented, or very materially lessened, by the adoption of proper precautions; also, that such precautions, unless they be of a systematic character, are largely frustrated by the avarice and selfish carelessness of individuals—not of all, but of some. And if only *some* are allowed to scatter the seeds of infectious diseases, our safety in this respect is gone. The Legislature has enjoined upon the Municipal

authorities the carrying out of such systems, and has, as in all other matters of executive, given to these Municipal authorities the power of enforcing these systems. But it would be a most painful thing to find any section, even though it be only a small section, of our profession arrayed in antagonism to that which bids fair to be the means of saving life and health,—to find in such a position members of that profession which has furnished so many noble examples of heroism, quiet and unobtrusive, but none the less real, in the devotion of time, talent, health and life to the cause of suffering humanity, to the tasks of investigating and combatting the causes of disease, and of stemming the tide of destructive epidemics.

Your Committee is glad to be able to report that there are not many who will allow trifling objections to stand in the way of measures calculated to shield our helpless little ones from criminal carelessness or indifference. There is only one of these objections to which your Committee thinks it necessary to allude ; and to it we would allude, as it is one that exists in the minds of some few members of our profession, who possess a high sense of honour, but coupled, we would respectfully add, with a mistaken sense of their obligations, which, in the opinion of this Committee, can never require them to be parties to an attempt to hide the existence of danger, and allow it to overhang the defenceless heads of our poor little children.

Your Committee would again recommend that the efforts which are being made to have Hygiene more extensively taught in our schools in lieu of less important subjects receive your active and energetic support.

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[Clauses referring to Vital Statistics and Climatology in Ontario and the Dominion generally ; and to the communication from the Ontario Women's Christian Temperance Union.]

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Thanking you for the attentive hearing you have given to this Report, and hoping that through your recommendations the profession will respond to the appeals made in it, it is now respectfully submitted.

After the reception of the Report the following resolutions were carried unanimously :—

Moved by Dr. Campbell, seconded by Dr. McLean,—That this Association would earnestly press upon the attention of the Government the necessity of enacting such laws as will secure the appointment of a Board of Health and Medical Health Officer for each Municipality or suitable group of Municipalities in the Province.

Moved by Dr. R. Carney, seconded by Dr. Ferguson,—That this Association would urge upon its members the desirability of advocating, in their respective localities, the adoption of the suggestions set forth in the resolution relating to the appointment of Local Boards.

Article III.

DIRECTIONS FOR PREVENTING THE SPREAD OF ASIATIC CHOLERA.

(Pamphlet No. 14, issued by the Provincial Board of Health of Ontario.)

In view of the possibility of an epidemic of Asiatic Cholera in this Province, the Provincial Board of Health desires to emphasize some of the remarks made in several pamphlets which it has issued at various times since its formation, with the object of bringing about a better sanitary condition throughout the Province.

Among the pamphlets referred to may be mentioned that issued last year entitled "How to Check the Spread of Contagious or Infectious Diseases," that recently issued on the "Disposal of Sewage," the "By-laws suggested to Municipalities" for the pre-

servation of the Public Health, and the papers from various sources touching on Water Supply, Floods, Drainage, Ventilation, and kindred subjects in the Annual Report of the Board. Any of the above may be obtained on application to the Secretary. The Board at the same time desires to give certain special directions applicable to the existence of Cholera.

Collections of filth, impure air, and impure water act as hot-beds ready to foster, develope and spread disease the moment the first case makes it appearance.

This remark is applicable to many diseases frequently in our midst as well as to Cholera; and it is well to remember that whatever steps for removing the impurities referred to may now be taken, they will be repaid tenfold in the lessening of the amount of disease in general, even if Cholera should not visit us. But should it appear amongst us, it may be a life-long regret to many that such necessary means were not taken in time.

In the event of Cholera visiting us, it must be remembered that, as in the case of other infectious diseases, every infected person should be considered a centre of propagation of the disease, its special contagion, contained in the discharges from the bowels and stomach, being transported by air and water, and spreading in proportion to the density and want of cleanliness of the population among whom it occurs. The germs of Cholera, like other organisms, multiply themselves to an unlimited extent, so long as suitable conditions exist for that multiplication. These conditions are to be found in impure air, impure food and drink, overcrowded and badly ventilated houses and other conditions of filth.

Precautions to be Taken by Private Individuals.

All the precautions laid down more fully in the pamphlets and papers before referred to as necessary at all times should be observed with the greatest care at the present time:—

1. The cleaning and disinfection of privies should be carefully attended to. All pits which have not been emptied during the present year should at once be thoroughly disinfected by the addition of a sufficient quantity of a solution of sulphate of copper or sulphate of iron, as directed in Section 14, and then emptied; and all privy pits should be disinfected at least twice a week by one of these processess, or by the addition of wood or coal ashes. Whatever garbage is capable of being burned should be so treated, and all that cannot be so dealt with should be frequently removed.

2. Each individual must look closely to his water supply. If from a private source, regarding the purity of which he is not quite certain, he should have the water analyzed. Great care should be exercised by persons in partaking of water from outside sources, regarding which they have no knowledge. If filters be in use, they should be cleansed and their contents renewed.

3 Similar care should be exercised regarding ice and milk supply: also not to partake of unripe, half-decayed or indigestible vegetables and fruit. Should Cholera appear in our midst, these precautions must be more rigidly observed, and should extend to other articles of food and drink.

4. It should be borne in mind that the contagion of Cholera is contained principally in the discharges from the bowels, and may be conveyed by contamination (from these discharges) of water, food or air. It may find its way into wells and cisterns; may be carried into the air from discharges not disinfected, or from the washings of clothing thrown upon the ground, into closets, or into badly trapped and ventilated drains; or may adhere to walls and clothing or other articles.

5. The greatest care should be taken to guard against these various avenues of approach, and the utmost cleanliness should be observed. In outbuildings, sheds, etc., lime-wash and other disinfectants should be freely used. Those suited to special circumstances will be found in Section 14 of this pamphlet.

6. Great attention should be paid to the proper trapping and ventilation of waste-pipes and all the connections of house drains, to the flushing of sewers and other points referred to in Pamphlet No. 11 issued by this Board.

7. Persons should avoid all exposure, direct or indirect, to special contagion; and

should not permit any person or thing to come direct from a case of this disease, unless previously disinfected under competent supervision. After visiting a case, a person should bathe himself, especially his hands, face and hair, in a disinfective solution, and change and disinfect his clothing. The passages from any person sick with the disease should not be allowed to be placed, without previous disinfection, in water-closets or privies, but should be attended to as in Sec. 13. Persons should not ride in any vehicle which has been employed in the conveyance of an infected person, unless it has been subsequently disinfected. They should not wear nor handle clothing worn by a person during sickness or convalesence from the disease, nor drink from the same cup, nor put in the mouth anything used by any such person.

8. Great care should be exercised as to clothing, bedding, carpets, curtains, upholstered goods, and other articles which may have been exposed to and retain infection. No such articles should be purchased at second-hand unless the purchaser is satisfied that they have been properly disinfected in accordance with Sec. 21 ; and until efficient health organizations are established and supported, so as to prevent the transmission of disease from infected localities by regulations in accordance with the provisions of the Public Health Act of 1882, and the directions given below to municipal authorities, individuals will have to be vigilant as to receiving articles from infected houses.

9. It is of great importance to notice and carefully attend to cases of Diarrhœa, which at other times might not be thought of much consequence ; and valuable time should not be lost in depending upon the numberless "sure cures" which are so extensively advertised. Any person who may be subject to derangement of the intestinal tract should wear a flannel bandage. Unnecessary exposure to damp and cold, over-fatigue and undue irregularity in regard to meals should be avoided, as also excesses in eating and drinking.

Management of the Sick Room, and Duties of Attendants.

10. Every case of Cholera, as of other infectious disease, should be at once reported to the Health Officer appointed by the Local Board of Health. (See Secs. 18, 19 and 20, Public Health Act of 1882).

11. The bed-room of a person attacked by Cholera should be in an upper story, if there is more than one. It should be large, having an absolute air-space of at least 1,000 cubic feet for each individual, and should have a liberal supply of fresh air—at least 3,000 cubic feet per head per hour. In summer the supply should be unlimited ; windows thrown open, and draughts on the patient prevented by a fine gauze or wire netting, slanting from the top of the sash to within two inches of the ceiling. If there be a fire-place or any flues they should be utilized for purposes of ventilation. The room should be cleared of all needless clothing, carpets, stuffed furniture, drapery, or any material liable to harbour the germs of the disease. Nor should feather beds, feather pillows, down quilts, or hair mattrasses be used, unless it is the intention to destroy them on the termination of the case, or to take every pains to thoroughly disinfect them by opening their covers, removing the contents and exposing them to the fumes of chlorine, or of sulphurous acid, or to intense heat.

13. The discharges from the kidneys and bowels should be passed into vessels containing a pint of disinfectant, and immediately buried at least a hundred feet from any well or other drinking-water supply. If these precautions are impracticable, let the discharges be passed on old cloths, which should immediately be burned in a stove or fireplace in such a way as to secure complete ignition.

14. For convenience, a few disinfectants are here grouped together :—

(1) Solution of corrosive sublimate : 1 oz. to 8 galls.
(2) " sulphate of copper : 1 ℔. to 5 galls.
(3) " chloride of zinc : water, 1 gal.; sulphate of zinc, 4 oz.; common salt, 2 oz.
(4) ' chloride of lead : dissolve two drachms of nitrate of lead in a quart of water—then, in a larger vessel containing a gallon of water, dissolve two tablespoonfuls of common salt (chloride sodium); mix the two solutions together and store for daily use.

(5) Solution of carbolic acid : say 1 part in 20 to 40 of water.
(6) " copperas : $1\frac{1}{2}$ lbs. commercial sulphate of iron to 1 gal water.
(7) " chlorinated soda (or lime).
(8) Carbolate of lime.
(9) Chlorine fumes : peroxide of manganese, 1 part; sulphuric acid, 2 ; chloride of sodium, 3 ; water, 2. To be mixed in a glazed dish, and placed on a warm stove or other heating surface.
(10) Fumes of burning sulphur (sulphurous acid).
(11) Heat : 212° to 250° F.

Disinfectants 5 and 7, diluted with equal parts of water, may be used for washing the hands and other parts of the body.

3 and 4 may be used for cups and other utensils ; these, if employed for drinking purposes, should be rinsed in clear water after using the disinfectant.

1, 3, 4, 9, 10 and 11 may be used for bedding, clothing and other textile fabrics. Carpets, curtains, and other coloured articles, besides being cleaned by ordinary processes, should be exposed to the action of heat (sub-sec. 11) for several hours.

1, 5, 9 and 10 may be used for wood-work of furniture without fear of injury in the highest strength mentioned.

5 should be employed for scrubbing floors.

2 and 6, especially the former, may be used for disinfecting privies, excreta, etc.

The carbolic acid solution may be made to permeate the air by spray from an atomizer, and so assist in destroying germs in breathable air by actual contact.

In regard to the use of 9 and 10, it must be remembered that they have bleaching properties, especially the former.

N.B.—Extreme caution should be used in the storing of these disinfectants, especially those which are colourless and odourless, as most of them are strong poisons.

15. All soiled clothing and bedding should be immediately changed and disposed of by being placed at once in a tub containing a solution of corrosive sublimate (sec. 14), or of sulphate of zinc in the proportion of 1 to 120, or of chloride of zinc in the proportion of 1 to 240, or in the chloride of lead solution (sec. 14). They should be left in one of these solutions for twenty-four hours, then rinsed in clear water and washed. Clothing which has not been soiled may be treated in the same manner ; or, better still, when practicable, by the agency of heat. Dr. Henry, of Manchester, disinfected Scarlet Fever clothing by exposure to 212° F. for one hour. A brick oven or portable furnace will answer the purpose, the clothes to be disinfected being hung on wires. Boiling clothes is not so good as baking, but still is useful, and should always be preceded by the use of a disinfectant as just described.

16. The room should be carefully dusted and the floor swept, the latter being previously sprinkled over with wet sand. When sweeping is completed, the dust and sand should be deposited in the centre of the fire.

17. Nurses and attendants should be required to keep themselves and their patients as clean as possible, disinfecting their hands frequently by a solution of one part of carbolic acid in two of glycerine and forty of water, or by a solution of chlorinated soda. Attendants should also wear cotton or linen (not woollen) clothes or overalls, to which particles will not readily adhere, and which may be more easily disinfected.

18. When convalescence has taken place the patient should be bathed, should put on clean clothes, and be placed in a room distant from the sick room, before joining the other members of the household.

19. The body of a person who has died of cholera should be washed with a strong solution of corrosive sublimate or of chloride of lead double the strength of those in Sec. 14, and wrapped in a sheet wet with the same.

20. When the very desirable precaution of using saw dust to fill up the coffin is employed, it should be well moistened with a strong solution of corrosive sublimate, chloride of lead, or carbolic acid, or mixed with a large quantity of carbolate of lime. In no case should a public funeral be held, but the body should be buried without delay and as few persons as possible should attend. In fact, in case of an epidemic of Cholera, none should attend but the undertaker and assistants.

21. After the termination of the case, the contents of the room should be disinfected in the modes already described. The room itself should also be thoroughly disinfected; the ceiling, walls, and floor carefully brushed, and the sweepings dealt with as before recommended. The room should then be exposed to the fumes of chlorine by the method already described in Sec. 14, or to the fumes of burning sulphur for a period varying from six to twenty-four hours. To carry out this latter process, a metallic dish should be suspended over a tub of water, or should have ashes placed in it; all doors, windows, and the chimney being tightly closed, sulphur, mixed with a little saltpetre, is to be then placed in the dish and lighted. The proportions should be two pounds of sulphur for every 1,000 cubic feet of space. In a very long room it is best to have the sulphur in two or more places. After the fumigation is completed, the doors and windows should be opened, and kept open for several hours. In disinfecting with chlorine or sulphurous acid, the person setting the fumigation in operation must make a precipitate escape from the room the instant the process has commenced. Carpets fumigated on the floor by these methods should afterwards be removed and disinfected as before described. Pillows and feather beds, mattrasses, and upholstered furniture, after being disinfected on the outside, should be cut open and treated as before described.

Duties of Municipal Authorities.

(See the Public Health Act of 1882, Cap. 190, R. S. O., and Cap. 18, 46 Vic.)

22. Every Municipal Council should at once organize a Local Board of Health, and adopt by-laws similar to those suggested by the Provincial Board with regard to the removal of all kinds of filth, the protection of water, food and air, and the various means for preventing the spread of contagious diseases, which suggestions are contained in document No. 12 of this Board, entitled, "By-laws suggested for the Guidance of Municipal Councils in establishing Local Boards of Health," and copies of which have been sent to all Municipal Clerks and Councillors throughout the Province.

23. The Local Board of Health should issue and enforce directions for the immediate reporting of all cases or suspected cases of Cholera, as of other infectious diseases, in compliance with the Public Health Act of 1882.

24. On receipt of such notices, the Local Health Officers should immediately examine into the reports. If the medical attendant reports the case this will be sufficient verification.

The Board should secure the isolation of those sick with or exposed to the disease;

Give notice of infected places;

Attend more carefully to the relief of the poor;

Regulate funerals of persons dead from the disease;

Cause rooms, clothing and premises to be properly disinfected;

Give certificates of recovery and of freedom from liability to communicate the disease.

25. Every person known to be sick with the disease should be promptly and effectually isolated from the public. No more persons than are necessary should have charge of the patient, and these should be restricted in their intercourse with other persons. The children of the family and other inmates should be prevented from mingling with others in schools or other places until the period of incubation of the disease shall have passed.

26. Notices should be placed on the house in which a case of the disease exists, and no unnecessary persons allowed to enter.

27. Boards of Health should have distributed in every house copies of the instructions to householders and private individuals contained in this pamphlet, or others of a similar nature, and should see that the same are carried out.

28. In populous municipalities isolation hospitals should be provided just as soon as intelligence is received of the existence of Cholera on this continent. A description of one of the best and cheapest of such hospitals, with an engraving of the same, will be found at the end of this pamphlet. These hospitals, if happily not required for cases of Cholera, will be a useful investment for cases of Smallpox, Scarlet Fever, or Diphtheria, constantly occurring. In less populous districts they may either be imported (being portable) or may be rapidly constructed on the nearer approach of the disease, or if required for other infectious diseases.

29. In populous districts Reception Buildings should also be established for the reception of persons not actually attacked with Cholera, but who require to be kept under observation lest they should become fresh centres for spreading the disease. Such persons should there be provided with clean clothing, allowed to prosecute their daily avocations, and kept under observation fourteen days.

30. The Local Board of Health should provide a public laundry and disinfecting house, otherwise the infected clothing may become a ready means of spreading the disease.

31. If it be found that carelessness exists in carrying out the precautions recommended regarding funerals, some officer or officers should be detailed by the Local Board of Health to see that they are so carried out.

32. It must be borne in mind by local authorities that want of the necessities of life and of medical attendance and medicines favour the spread of the disease, and increase mortality, and that such wants are more apt to occur during a time of epidemic, when bread-winners may be prostrated or waiting upon those who are attacked.

33. Local Health Officers should be on the alert, without causing unnecessary alarm, for reports of approaching disease, and should promptly notify the Secretary of the Provincial Board of any such. They should also make notes of the source of any case which may occur in their locality, and of all other facts likely to be of service in a statistical point of view, or in the future study of the disease, and its prevention or limitation.

Description of Hospitals used in Connection with the Cantonal Hospital at Geneva, and Adapted to the Isolation and Treatment of Cholera, Scarlet Fever, Small-Pox, Diphtheria, etc.

Extracted and Translated by Dr. C. W. Covernton, from the Official Report of a paper read by Professor Jullard, and of the discussion thereon, at the International Congress at Geneva, September, 1882.

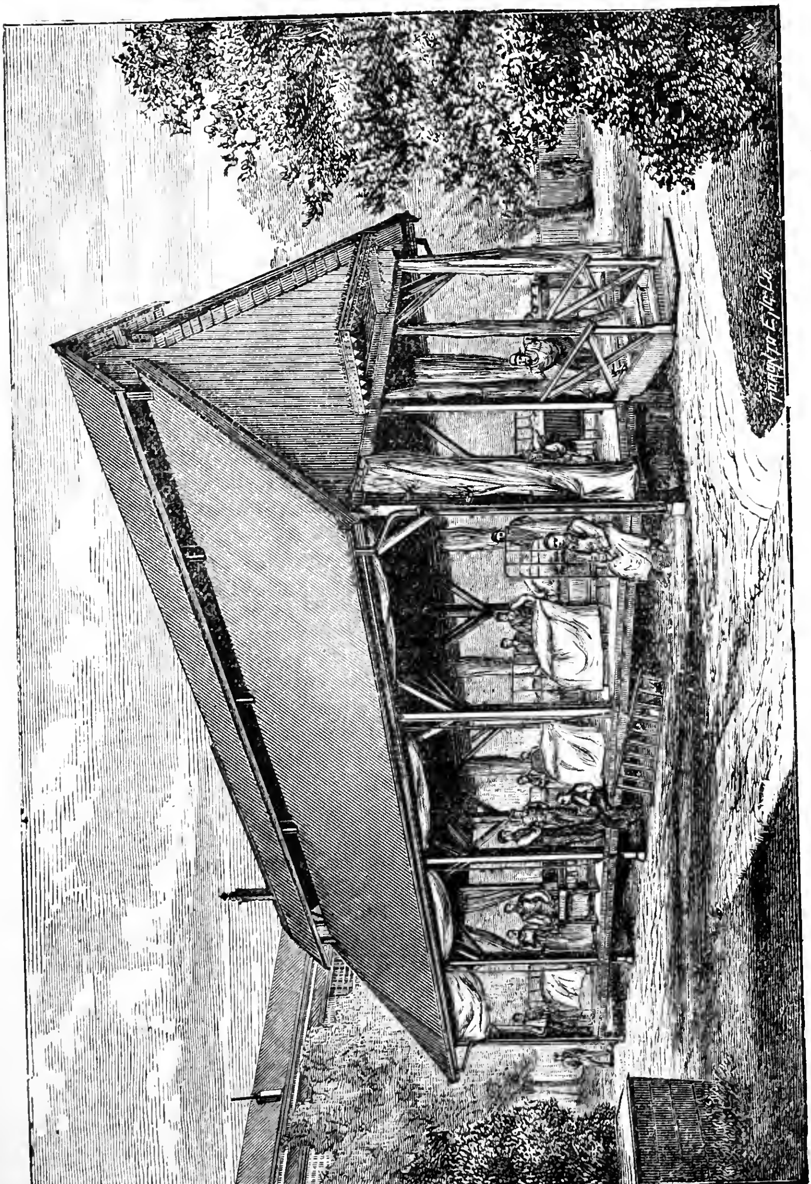
"The sleepers and frame generally are of wood, fifteen metres (49 ft. 2 in.) in length and seven (22 ft. 9 in.) in breadth. The flooring is seventy-five centimetres (2 ft. 5 in.) above the ground. The lateral walls are formed by sail-cloth, which can be raised or lowered at will. The floor is of hardwood—tongued and grooved, oiled and waxed. The roof is extensively open its whole length. Each tent contains eight beds. During the night, or when rain falls or the wind is high, the sail-cloths are lowered. During the day they are raised, and the patients are thus surrounded by fresh air. These tents offer the following advantages:—1st. They supply a very superior aeration to that which the most perfected system of ventilation can yield. When the sail-cloths are raised, the patients, as I have said, are in the open air, sheltered from the sun by the roof; when they are lowered, the air penetrates through the meshes of the cloth and escapes by the apertures in the roof. The patients thus breathe always a pure and vivifying air, and the hospital smell, which prevails more or less in every (other) hospital, is never perceived. * * * 2nd. The abode in these tents is very agreeable, and the patients are more cheerful and happy than in the wards of the hospital. 3rd. They afford an opportunity of completely emptying the wards of the hospital* for nearly half the year, and we have thus in Geneva a summer and winter hospital. This periodical emptying of the (surgical) wards, which thus are unoccupied each year between five and six months, and can during that time be thoroughly aired, disinfected and repaired, is a consideration to which I attach the utmost importance as one of the most powerful means of completely purifying and rendering a hospital more healthy: thanks to this system, we were enabled to free ourselves from the hospital gangrene of 1871. Since that period we have not been troubled with any epidemic.

"The only objection that can be urged to these tents or huts is that the patients are

* [Whilst these hospital tents are eminently suited for the treatment of infectious diseases, it must be borne in mind that their use, in the intention of the originators of them, was by no means limited to this class of diseases; this same kind of building—not the same building, of course—may be used for other forms of disease.]

exposed to cold and variations of temperature; but experience has taught us that this fancied objection was not a real one, as I have never noticed any bad results.

*   *   *   *   *



Cantonal Hospital at Geneva, visited by the Delegates to the International Congress.

(Engraved from a Photograph contained in the Official Report.)

"Dr. Drouineau, Physician to l'Association des dames de la Charente Inferieure, then described the hospital tent employed there, presenting exteriorly the appearance of all huts with tent roofs. An open space, protected on each side by canvas, serves as a walk. The canvas may be raised and the panels of the side walls of canvas removed, and

then there remains nothing but the skeleton of the hut, realizing thus the advantages of the cantonal summer wards. But if it is a question of making it available for winter, the canvas walls are replaced, the methods adopted for warming by stoves, or otherwise, employed, and with the double wall of canvas fastened down on the inside, the warmth is increased. Dr. Drouineau considered that when such tents were employed for isolation hospitals for infectious diseases, after thorough disinfection and all practicable precautions taken when the epidemic had ceased, there would be no danger in using them again on the breaking out of other epidemics, and thus have on hand fit and economical means for limiting the spread of disease. Dr. Georgevitch, of Belgrade, mentioned that in passing through Vienna he had seen similar hospital tents used by M. Bilroth. He also exhibited the plan of one executed by MM. Volckner and Gruber for the Government of Servia."

At the Provincial Exhibition and at the Toronto Industrial Exhibition, a portable structure will be exhibited as a model for an Isolation Hospital. It will differ somewhat from the Geneva Hospital: the sail-cloth which, when required, closes in the sides will be stretched on frames, revolving on horizontal pivots. These frames can be more readily and closely adjusted than loose sail-cloth in the form of curtains, and they may be utilized as sloping shades to protect from sun and rain, without closing the openings at the sides.

To the Members of the Provincial Board of Health :—

Gentlemen,—Your Committee on Epidemic, Endemic and Contagions Diseases begs leave to submit for your consideration the groundwork of a pamphlet which it would recommend should be ready to be issued as soon as the first outbreak of cholera occurs on this continent—or immediately, if you deem it more advisable.

All of which is respectfully submitted.

(Sgd.) C. W. Covernton,
Wm. Oldright.

The report and pamphlet were considered in Committee of the Whole, and adopted; and it was further ordered that the pamphlet be published, and that it embody a cut and description of the Geneva Hospital tent.

16th August, 1883.

Article IV.

ON THE DISPOSAL OF SEWAGE.

(Pamphlet No. 11, issued by the Provincial Board of Health of Ontario.)

In most localities in Canada the supply of drinking-water is taken from wells, and the household slops and excrement are deposited in privies. In many cases the well is in such close proximity to the privy as to give good grounds for the unpleasant suspicion that there may be communication between them. That the well-water has a good appearance and taste and is odourless is no proof that it has not suffered contamination, since highly-polluted water often has these characteristics; nor is the fact that the privy may be on lower ground than the well a sufficient guarantee of safety, as it may still be many feet above the bottom of the latter. It is a matter of general observation that a deep hole in the ground has a tendency to drain shallower holes in its neighbourhood. In addition to polluting drinking-water, privies poison the air by their filthy emanations, and their ill effects are aggravated on account of the long intervals that elapse between the times of emptying them. Many instances in various parts of this Province of wells polluted by sewage matter, and of the baneful effects of air rendered injurious in the manner indicated above, have come under the notice of the Board; and it has therefore been thought advisable to issue a pamphlet, pointing out the principles and the best methods to be adopted in order to avoid these results.

In view of the evils mentioned above, the advisability of abolishing the privy-pit system and of substituting something better in its place will not be questioned. The first point to be considered by each municipality is what system is best suited to its own requirements and conditions. There can be very little doubt that a properly constructed and connected system of sewers and water-works affords the best means of disposing of the slops and excremental waste; but, in certain cases, the construction of works of this kind may be considered to be out of question, and some other solution of the problem must be looked for. In many cases conditions very objectionable, from a sanitary point of view, have been introduced, from the fact of the municipal authorities not having considered the system of sewage-disposal best adapted to the circumstances of the municipality, and not having decided upon plans in accordance therewith. Drains and sewers have been built without regard to proper outfall; closets and cess-pools have been connected with drains quite unfitted to receive and safely carry off their contents. Solid refuse, again, has been deposited and left to decompose in very unsuitable places, and, in many instances, houses have subsequently been built on such unhealthy collections of "made soil." It will save a great amount of subsequent expense, confusion and annoyance, if the municipality decide, in the first place, the system best adapted to it, and proceed on some settled plan.

This pamphlet will present certain considerations which may be of assistance in arriving at such decision, the services of a competent engineer being at the same time called into requisition in each case.

I.—Dry Systems of Removal.

First, then, attention will be directed to the best methods of disposal in those cases where the water-carriage system cannot with advantage be adopted.

In this connection it will be found expedient to consider the question of the disposal of the whole refuse of the household. This consists of (1) ashes, dust, waste-paper, and other dry refuse not prejudicial to health; (2) kitchen-slops and vegetable and animal refuse; (3) bed-room slops, a mixture of wash-water and urine; (4) fæcal matter and the accompanying urine. The usual method of disposal is to throw the first and second into the ash-heap, the third and fourth into the privy. From an examination of the numerous methods which have been tried with varying success both in Europe and the United States, one is led to the general conclusion that the true principle in these cases is to keep

the liquid refuse separate from the solid and to dispose of the two in different ways. It is a matter of common observation that solid organic matter, if kept comparatively dry, is not subject to offensive putrefaction, while the reverse is the case when there is a certain quantity of water present, and a practical attention to this fact will obviate those putrefying masses which now form such abominations in our midst.

Solid Refuse.

Of the various methods hitherto tried for the disposal of solid excrement there are three which seem to have met with a fair degree of success. These are—

1. *The Hull Ash-closet System.*
2. *The Dry Earth system.*
3. *The Rochdale Pail system.*

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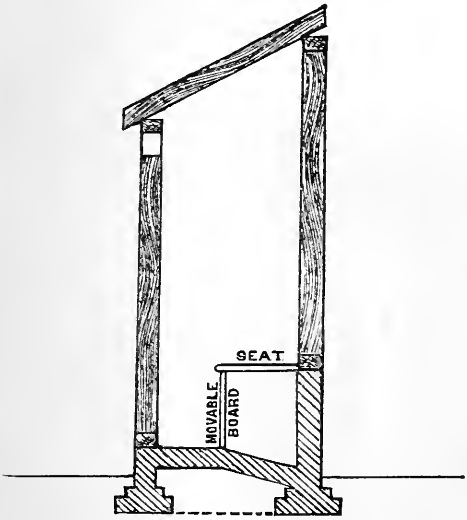
1. The Hull Ash Closet system.



HULL ASH-CLOSET. (Section.)
Intended to receive all the dry refuse of the household in addition to excrement.

In this closet the back, ends and floor of the receptacle under the seat are built of brick, laid in cement. The front side of the receptacle is a removable wooden piece, and the seat may be hinged. The floor is not sunk below the ground level, but slopes slightly from front to back. The whole is properly roofed in and ventilated. In the receptacle are deposited all the ashes, dust, waste-paper, solid kitchen refuse and excrement of the household. The small amount of urine that accompanies the excrement is absorbed by the ashes. All kinds of slops are rigidly excluded from the closet. When it is considered desirable to screen coal ashes, they may be screened into the closet after raising the hinged seat.

In Manchester a modification of this system exists, the floor being made level and the excrement being received into a pail, mixed with the ashes, as in the Hull closet. In some instances a fixed cinder sifter is arranged at the side of the closet, which directs the ashes on to the excrement and allows the cinders to fall into a box.

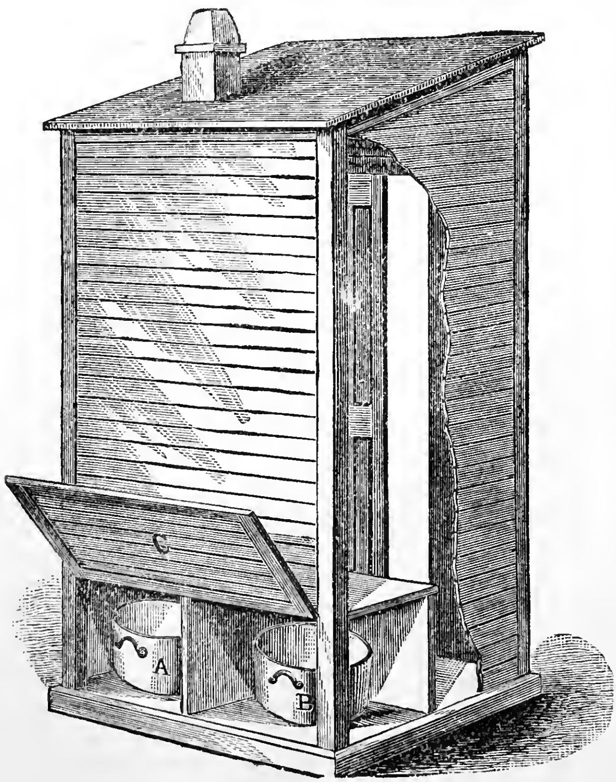
Mr. Netten Radcliffe made a careful examination of the Dry Ash system in Manchester, where 6,000 such privies were already in use, and thus reports:—

"In the series of inspections I made with reference to the working of this new system, I had occasion first to observe the contrast as to the nuisance between the dry-ash closet and the old midden closet. In several streets where the process of reconstruction had been only partially completed, it was possible to compare the old and new arrangements in contiguous premises. It was the contrast between open, big, uncleanable cavities, containing a greater or less amount of decomposing fæcal matter, and emitting a horrible, penetrating odour, and small receptacles, emitting hardly any appreciable smell, even with the nose above the privy seat, and admitting of thorough cleansing. Most significant testimony was given to the benefit of the change by some householders. Many houses in Manchester are built in parallel rows, a back passage running between the rows, and each house having a small yard, in the rear of which the privy is placed. Since the reconstruction of the privies '*it has been possible to open the back windows of the houses.*' The change, moreover, has affected beneficially the value of cottage property, and tenants are quite willing to give 3d. more rent weekly since the reconstruction of the privies, for the gain in decency and comfort. Soakage of excremental matter into the soil, and its passage into and accumulation in the drains, are of course obviated by the reconstruction, and the smaller space occupied by the new closet is not an unimportant matter. The removal of the excrement is, with the most ordinary care, free from offensiveness, and if

commonly conducted as I saw the operation, it may well be executed during the daytime, and the abomination of night-scavenging done away with.

"The use of cinder sifters has been adopted by householders with a readiness which proves how accurate the corporation was in depending upon their co-operation in the working of the scheme. The high price of coal during the last two years has contributed to this good result, from the value of the cinders, in encouraging its use. It is found, also, that a class of the population, commonly believed to be unmanageable in regard to any niceties of arrangement for excrement disposal, have rapidly appreciated the advantages of the new closet and taken to the use of the cinder sifter."

The removal is made once a week by the town authorities, and the material stored under waterproof sheds, where it undergoes a gentle fermentation, and is then sold for manure. It is said to be quite as inoffensive in appearance and odour as barn-yard manure.



PRIVY USED IN THE UNITED STATES.

A, Excrement Tub ; *B*, Tub of Dry Earth or Ashes ; *C*, Hinged portion of Back of Privy.

A modified form of the dry-ash closet has been used successfully in some parts of the United States and Canada. In it two pails are used—one under the seat to receive the excrement and the other in some convenient position for the ashes. Each time the closet is used a quantity of ashes is thrown in with a scoop.

Where pails are used, that for the excrement may be cut out of a petroleum barrel, and should for ordinary families, contain about ten gallons. In isolated cases a soap box will answer the purpose. The ash-receiver should be larger and may be rectangular in form.

The principal advantage in the use of pails seems to be in the convenience attending

the removal of their contents. They are also less liable to be injured, and can be more easily repaired than masonry receptacles.

The above closets are all out of doors.

2. The Dry Earth System.

This system is substantially the same as the dry-ash system above described, with the exception that earth is substituted for ashes. The earths best adapted for the purpose are moulds and loams. Pure sand is said to possess little or no deodorizing power, while pure clay is difficult to bring into the proper powdery condition, and has a tendency to absorb too much water.

It is not necessary that the earth should be absolutely dry; the drying that it receives from exposure to the atmosphere being sufficient. For use it must be free from lumps and in a powdery condition. This is best effected by screening it.

After being used it may be placed in a barrel, where it will undergo a slight heating and fermentation, after which it may be thrown out on the floor of the shed and exposed to the air in order to dry, and may then be used again. It is said that this process may be repeated ten or a dozen times with the same earth before it becomes offensive. This, however, is not recommended, especially in a country like ours, unless for the manurial value of the product; but it shows the value of dry earth as an absorbent and deodorizer. Anthracite coal ashes have been found to answer in this respect fully as well as loam. Wood ashes act much more powerfully than coal ashes as a deodorizer. When it is considered no longer desirable to use the material it is sold for manure.

House-closets on the dry earth system have been found to answer the purpose very well. They are usually constructed with some patent device for throwing the earth on the fæces each time the closet is used. One of the principal objects of their inventor, the Rev. Henry Moule, was to find a substitute for the water-closet in dwellings, factories, schools, etc.

With dry earth the soap-box or barrel, with a scoop, may be used as in the case of the ash system, and will answer every purpose.

Some excellent automatic earth closets, not very extravagant in price, are, however, made in this Province. The addresses of various manufacturers of them may be obtained on application to the Secretary of this Board.

The principal objections to the earth closet are the large quantity of earth required (estimated at about $1\frac{1}{2}$ pints per diem for each person if used only once), and the executive difficulties in applying the system to a large population.

It has proved a success under private management, or where regulations enforced, as, for instance, in barracks, factories and various public institutions.

3. The Rochdale Pail System.

This system differs from the dry ash-pail method before described principally in the fact that no absorbents are used. The pails are frequently removed, being fitted with tight covers, and clean pails left in their places.

The removal of dry refuse, ashes, etc., forms a part of the system. The excrement and the ashes are brought to a depot, where the latter are spread out on the floor to a certain depth. The excrement is then emptied into trenches formed in the ashes and treated with a small quantity of dilute sulphuric acid; the whole is then thoroughly mixed, becomes after a few weeks, quite inodorous, and forms a valuable manure. The removal and subsequent treatment has of course to be carried out by the municipal authorities.

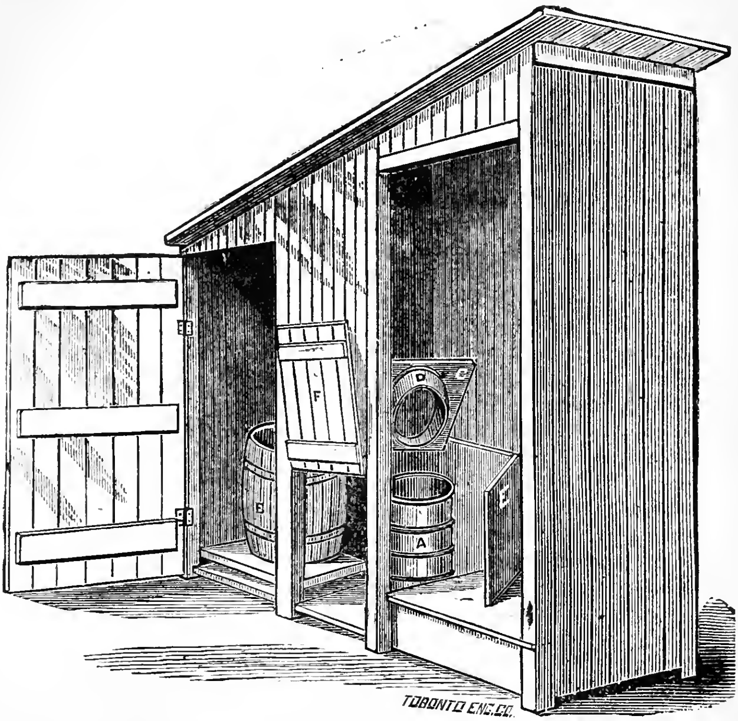
Mr. Radcliffe reports as follows:—

"That the system has been thoroughly approved by all who had had experience of it, and that it had not failed under the most varied circumstances, having proved equally efficacious in the highly rented house with its own closet, in the lodging-house, where great numbers were accommodated, and in the factory and workshop.

It need hardly be mentioned that this system is suited to out-door closets only.

Under the old privy system in Rochdale the cost of the removal of the excrement

of one thousand persons for one year was £71, Under the pail closet system it was £19 ; the resulting manure selling for three-fourths of the cost of collecting and preparing it.



ROCHDALE PAIL CLOSET.

A, Excrement Pail ; *B*, Ash-tub ; *C*, Seat Cover (raised) ; *D*, Iron Collar below seat (reaching into Pai when cover is down) ; *E*, Hinged upright of Seat ; *F*, door admitting from outside to Excrement Pail.

In this Closet ashes are not mixed with the excrement.

Mr. Radcliffe makes the following estimate of the cost of the dry earth system applied to a village of 1,000 inhabitants :—Original plant, £250 ; weekly outlay for earth and labour, £4 15*s.* ; annual cost, including interest on plant, £260. The product will be 730 tons of manure selling at seven shillings per ton.

In Hull the removal is made by contract. The contractor, in addition to receiving the material he collects and which he sells for such profit as he can obtain, is paid by the sanitary authority from two shillings to three shillings yearly for each house in his district.

Whatever system may be adopted, the old privy-pits should be thoroughly cleaned out and filled with fresh earth.

In many country towns and villages there is sufficient garden space to enable the excretal manure to be utilized ; whenever this is not the case the removal and disposal of the excreta should be undertaken by the municipal authorities, and in all cases they should have an efficient system of inspection carried out

Liquid Refuse.

In any of the proposed methods of dealing with solid excreta, the kitchen and chamber slops must on no account be mixed therewith.

Whenever practicable a system of pipe sewers should be devised for the purpose of disposing of these, and should be connected with the house yards by properly arranged traps. The entrance to these pipes should be under cover, but should not be within the

walls of the house. Since the volume of this concentrated sewage will in general be small, the pipes should be smaller and laid with steeper gradients than those used in connection with the water-carriage system. They should also be provided with flushing pipes at intervals, rising to the street surface so as to admit of periodical flushing by means of a hose to be connected with the street watering-cart. It may be advisable, also for the same purpose, to connect the sewer, at a few points, with the drains and gutters which carry off the rainfall during storms, but great care must be taken to make the connection in such a manner as to prevent the entrance of mud and other street debris. The sewage should not, on any account, be allowed to flow into any open-jointed water-drains, since at particular points in these, and during some seasons of the year, the level of the sub-soil water may sink below the drain, in which case the sewage would soak out into the surrounding soil. Lamp-holes and man-holes, for the proper examination and removal of accidental obstructions, and ventilating-shafts should also be constructed at proper points. Any urinals on the premises should be connected with the sewer and not with the closet. It is almost unnecessary to remark that no sewerage system should be constructed without the superintendence of a competent engineer.

It may be incidently pointed out here that the trenches in which the tight pipe sewers are laid act as blind drains to a great extent in carrying off the sub-soil water.

The disposal of the liquid sewage when it has reached the outside of the sewer system presents many difficulties. It may be allowed to flow into large bodies of water, such as our inland lakes, or into large streams, the water of which is not used for drinking purposes, and in which it is so diluted as to be comparatively harmless. There are, however, many objections to the latter method of disposal. If, from the situation of the town or village, neither of these methods is practicable, it may be collected in a large tank, from which it is periodically removed, and used as liquid manure, for which, on account of its concentration, it is peculiarly adapted. This removal may be automatic or otherwise.

Intermittent Downward Filtration.

In some places where it has been found impracticable to use it as manure, the following method has been adopted: A small quantity of waste land is under-drained at a depth of from four to six feet; the surface is then intersected with open ditches, which are so arranged that when the sewage is poured into them it flows only over a portion of the land at a time. By the action of the air contained in the soil and of the roots of vegetation, it is purified and then flows through the sub-soil drains into the nearest water-course. The same process is repeated on another portion of the land and then on another, and by the time the whole surface has been treated in this manner, the first portion is ready again to receive the sewage, the soil having had time to dry and re-absorb air. By this method, which is known to sanitarians as "intermittent downward filtration," the soil can never get soaked with water and the organic impurities are thoroughly destroyed by the action of the air and the roots of vegetation.

The requisite extent of filtering area, as estimated by the Rivers Pollution Commissioners (England), is one acre drained to a depth of six feet for every 3,300 of the population, but this ratio must vary according to the nature of the soil.

The soil should be porous and have an easy slope.

Irrigation

When used as manure the fields are irrigated with the liquid, either by means of surface trenches or open-jointed drain-tile pipes, laid about a foot below the surface. The former method is the cheapest and requires less care to maintain it in good working order. The soil should be under-drained and the sewage should be applied on the intermittent downward filtration principle explained above.

Sewage farms have been worked for a good many years in England and on the Continent of Europe, and although at first they were looked upon in many instances as public nuisances, yet of late years, with increasing experience and resulting improved methods, they have been gradually growing in public favour. It seems to be the general testimony

of medical men, chemists and others, that, when properly managed, they are in no wise injurious to the health of the people in the neighbourhood, and that the produce of such farms, both animal and vegetable, is fully as wholesome as that of any other.

On a sewage farm there should be at least three sets of fields, viz. : one for summer irrigation, a second for winter irrigation, and a third for what may be called storm-water and residual irrigation.

The fields for summer irrigation are treated regularly with the sewage during the growing period of the crop. When the harvesting of the crop or other circumstances render it necessary to stop the irrigation on the fields, it is directed on to the residual irrigation fields. This is also done during storms or floods, in cases where the storm-water passes through the sewers, when the volume of sewage is too great to be used on the ordinary fields. The fields for residual irrigation are best kept in grass and may be used for pasture.

During the winter the sewage is directed on to another set of fields. These are ploughed in the spring and cultivated during the ensuing season without any further addition of sewage; that received during the winter generally proving sufficient.

The experience of Dantzic on the Baltic has shown that winter irrigation is possible even in a cold climate. The mercury is said to fall to 6° or 8° degrees below zero every winter, and in the winter of 1874-5, when it reached 17° below zero, the irrigation was interrupted only three times, and only for a few days each time. "The ground is usually frozen to a depth of three or four feet for about three months; the snow is often several feet deep. The sewage flows out under the snow through the many furrows prepared for it, leaving a thick crust to be ploughed into the land in the spring. About thirty feet from the conduits the sewage often freezes. During the months of extreme cold, though the sand is so porous that the sewage sinks into it readily at all times, filtration alone can be depended upon. Nevertheless, if the plots of land are large and frequently changed, the purification of the sewage is, even in winter, more complete than can be accomplished by any of the chemical processes."

The experience of the State Insane Asylum, Augusta, Maine, has further tested the practicability of this method of sewage disposal in winter. "When the mercury stood at nearly 0° Fahr., and the ground was frozen hard, the sewage was found to disappear very soon after it was put on the land. In the spring the early rains wash any refuse that there may happen to be deep into the soil, and no offensive odours are noticed. The surface of the ground is then sometimes found covered with a brownish scum."

In the smaller towns and villages of Canada, where there is usually a sufficient supply of garden space attached to each house in the suburbs and outskirts, similar methods to those described above may be employed on a small scale by householders. Care must be taken to lead the sewage by a tight drain pipe through the ground where there is any danger of its contaminating the drinking-water; it may then be discharged into the garden by a system of open-jointed drain-pipes, placed ten inches or a foot below the surface. If the soil is not very porous it should be under-drained.

In the winter it may be discharged on the surface of the ground if the underground drains are found to choke with ice. Any method of disposal on the surface of well under-drained ground, provided it be at a sufficient distance from the house, is better than depositing sewage in cess-pits, which experience has shown to be almost invariably in a leaky condition.

The central and more thickly populated portions of the town should be sewered as previously described.

If in any case a cess-pit is considered an absolute necessity, it should be built of brick laid in cement, with both bottom and top arched. It should be surrounded with a clay puddle, and lined inside with a coating of cement. The drain emptying into it should be well trapped, and both drain and pit ventilated at a safe distance overhead. The pit should not be more than six or seven feet deep, and should be emptied periodically by the odourless process.

In some public institutions in England where earth closets are used, the slops are collected in tanks and sold as manure.

In bringing this subject to a close it may be well to recapitulate some of the facts

upon which the above proposed methods of sewage disposal are founded. These are as follows:—Solid organic refuse, if kept sufficiently dry, does not undergo a putrefactive and offensive decomposition. Coal and wood ashes, and most kinds of earths, possess great deodorizing properties, and when mixed with solid fæces in the proper proportions will, in a short time, through a process of inoffensive fermentation, form a valuable manure. Soils may be repeatedly soaked with liquid sewage, provided they are well under-drained and a sufficient time is permitted to elapse between each application so as to allow the soil to fill up again with air, which of course takes the place of the water as the latter filters through. This air oxidizes the organic portion of the sewage, and if the under-drains are deep enough the water flows from them sufficiently purified to be allowed to pass into the neighbouring streams when these are not used for drinking or washing purposes.

The action of the air may be supplemented with advantage by that of the roots of vegetation, and hence it will be found expedient in many cases to establish sewage-farms.

No system of sewage disposal has yet been made to pay its own expenses by direct money returns. The most that can be hoped from the use of sewage as manure is to keep down in some degree the necessary expenses of the process. If the ultimate object of all systems of sewage disposal, the health and comfort of the population, is secured at the cost of a not undue outlay, there will be good reason for satisfaction.

II.—The Water Carriage System.

It is not intended in this pamphlet to deal with all the questions which would need to be considered in connection with a proper system of sewerage. To do so would unduly augment its dimensions, and many such details relate to those parts of the subject which must of necessity presuppose the presence and superintendence of a professional engineer. The pamphlet will therefore only take up those points which may not necessarily or presumably come under the notice of an engineer, and errors in regard to which are constantly causing unsanitary conditions and producing disease.

The primary question of deciding as to whether there are *proper facilities for outfall and a sufficient water-supply*, has already been considered in the first portion of the pamphlet. Its importance before commencing or allowing the construction of sewers cannot be too strongly insisted upon.

The materials and joints of drains have also been incidentally alluded to, as also their shape, course, and foundation. In this connection the too common practice of using wooden box-drains must be condemned. They allow the sewage to soak out, they soon break down, and they permit of deposit and choking, especially when laid on the flat, as they commonly are. If they are used to avoid expense for any temporary purpose, they should be laid with the angle down, so as to secure a better flow and less deposit. But for a permanent drain, glazed-tile pipes, with impervious joints, should be used; or, inside of houses, cast iron pipes, which when hot have been dipped in pitch. The joints of these should be filled with lead and caulked. These inside iron drains, should, when possible, be left exposed to view. In some cities this object is carried out, even as regards the lower horizontal portions, by fastening them along the basement walls. Any leakage is in this way made visible, and can at once be remedied. This precaution should be observed in regard to all inside plumbing.

The errors which are most frequently coming under notice as detrimental to health are those which allow of the

Entrance of Sewer Gases into Houses.

It is no conclusive proof of the absence of sewer gases that they cannot be perceived by the sense of smell.

Some injurious gases reveal themselves unpleasantly to the nose, whilst others do not. These last are so insidious in their nature as to be doubly dangerous. As examples, the baneful results which ensue from living in houses under which water lodges and becomes stagnant may be referred to. There are few medical practitioners who have not witnessed

these results. The miasmatic poison of ague is similarly inodorous, or has no necessarily unpleasant odour. In like manner sewers have sometimes very little unpleasant smell. In some cases we have a smell somewhat similar to that produced by those burning fluids into the composition of which fusel-oil enters. People living in a house become so accustomed to these faint odours as to take little notice of them; and with some people the sense of smell is not very acute. Hence we must be very careful how we accept negative evidence as to the presence of noxious gases. And hence, too, we must be all the more careful to avoid their existence and presence, and to devise means to this end.

It is plain that to prevent the constant accumulation of noxious gases, we must in the first place get rid, as far as possible, of decomposable material before it begins to decompose; and, secondly, we must see that the noxious gases from any decomposing material which has evaded our care do not reach us. These two propositions may seem very simple, but in practice we often find that they have not been carried out.

As regards the first of them it has become an acknowledged desideratum amongst sanitarians that all decomposable material entering sewers should pass out of the sewer system within twenty-four hours. For the accomplishment of this object many points need careful consideration, such as the materials of which drains and sewers are to be constructed, their course, their slope, their bed or foundation, the construction of their joints, the course of their junctions, the facilities for flushing them, etc. Some details in connection with these points have been referred to above; others will necessarily come under the direct superintendence of an engineer.

It will be found that with all possible care in carrying off rapidly the material thrown into the drains, we cannot entirely prevent the collection of a certain amount of noxious gases in them. We find that such gases are in practice disposed of in three principal ways:

1. In a very large number of cases they are allowed to escape into the inside of dwellings. To such an extent is this the case that some sanitarians advise us to abolish sewers altogether, an advice which is not practicable under existing circumstances.

2. In some instances they are supposed to discharge through gratings in the centre of the road bed.

But in many cases they discharge at the edge of the sidewalk through the traps of gullies emptied by evaporation. Examples of this may be seen at many street corners in winter time.

The ventilating gratings of sewers are often so clogged with dirt that they are of little value in disposing of the total amount of sewer-gas. In winter they are very often completely closed.

In a few cases the sewer-gas is discharged above the house-tops. Very little consideration will suffice to show that this is the proper method. It is surely safer to discharge it away above our heads than at our very feet.

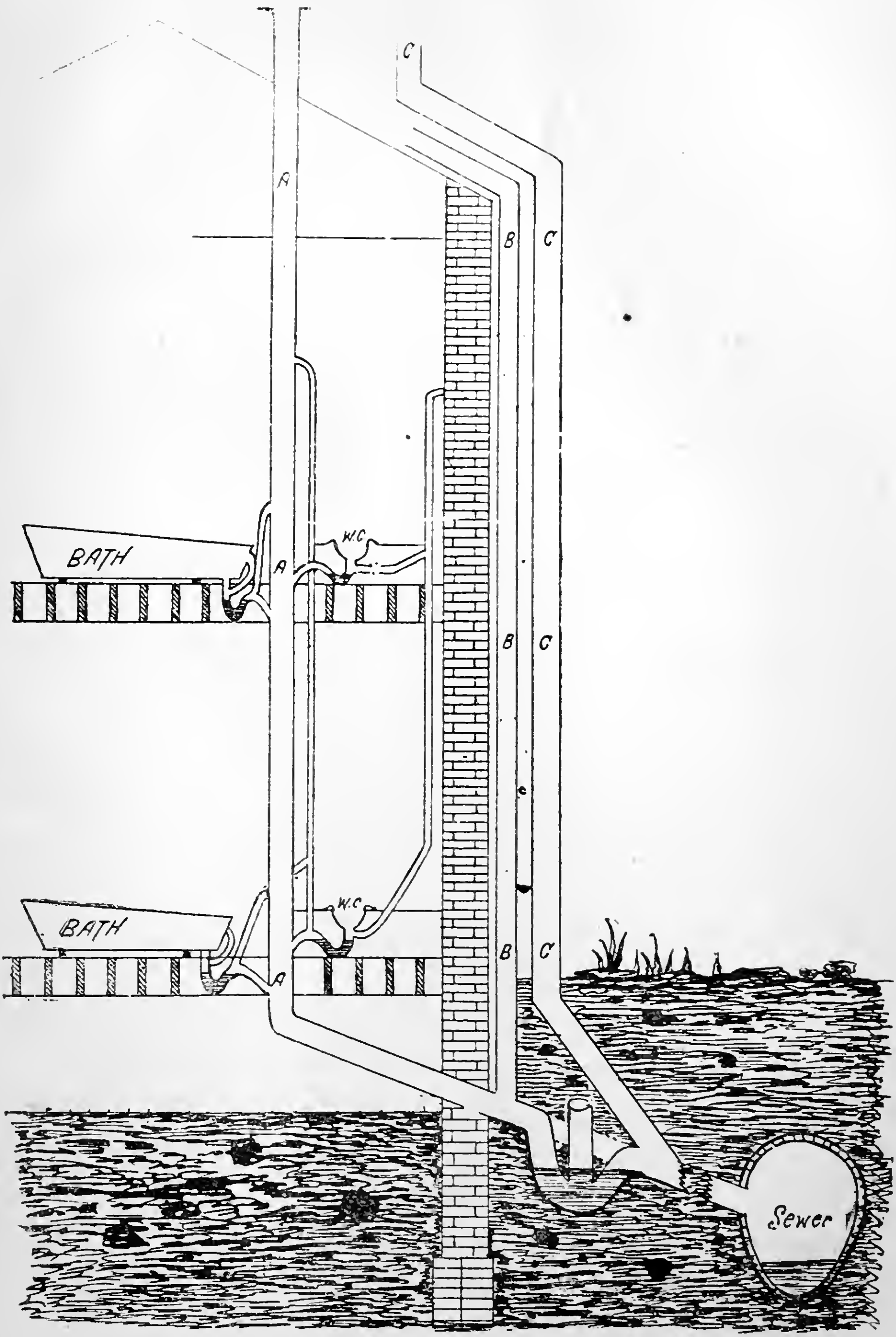
This method is illustrated in the diagram on page 221.

It is almost superfluous to say that every precaution should be taken to prevent sewer-gas from disposing of itself in the first mode,—by finding its way into houses; and yet a very great deal of carelessness exists on this point.

It will be necessary then to consider how sewer-gases obtain entrance into houses:—

1. In some cases there is no "trap" interposed between the drain or sewer and the interior of the building served by that drain or sewer, no attempt at any mechanical impediment to the return of sewer-gas. This, of course, should not be the case. Some form of trap should be placed as near as possible to the commencement of every waste-pipe.

2. Where there are traps they are liable to be forced. Some persons think that if they have a trap all is right, but a trap without a vent is of hardly any practical value. A trap with a protecting depth of water (commonly called the "seal") of three inches, (a three inch seal), only resists a pressure of some two ounces to the square inch. Any person can readily convince himself of the insufficiency of a water trap without a vent by filling such a one and blowing through it. Without any great exertion he can displace the water and force his breath through the trap. If he now make a vent between his mouth and the water he cannot displace the latter no matter how hard he blows.



A—Extension upwards of soil pipe.
B—Second ventilating tube.
C—Ventilator for drain in case a trap is placed between the sewer and house.

Let us next consider what influences are at work to force gas back through traps :—

a. The expansive force caused by pouring water into a drain : two bodies cannot occupy the same space at the same time, and if the lower part of the drain be full, or its mouth be closed by water in the sewer into which it empties, then the sudden pouring in of water will cause the confined gas to burst its way back through the trap.

b. Storm water suddenly filling the sewers has the same action.

c. The expansive force of hot water entering increases the temperature and consequently the bulk of the air. If raised suddenly from 50° to 150° the result would be a pressure equal to nearly seven feet head of water.

d. Direct afflation through the sewer : the wind blowing up the sewers will force the sewer gas backwards. Some engineers have proposed flap gates at the mouths of sewers. But it is better to let the fresh air blow up, and make sufficient vents for it to sweep through and purify the sewers.

e. Partial choking of the drain gives rise to confined air constantly increasing, expanding and being displaced. A vent allows the escape of all gas which would otherwise force the trap.

3. Again, sewer-gas may be admitted on account of the trap being emptied by syphoning. If to the end of the trap a tube bent downward be added, it forms the long leg of a syphon, the portion of the trap to which it is added being the short leg ; if a full stream be poured through the trap, the water will syphon out of it, leaving the se broken, as may be proved by actual experiment. An opening or vent at the arch of the syphon will of course prevent this.

4. A large body of water rushing full bore down a pipe into which a trapped tube empties will suck the water out of the trap.

This, again, will be prevented by a vent pipe.

5. Alterations may leave some pipe open or unsealed.

6. Disuse of a trap for a long time will allow evaporation and emptying of the trap, giving room for free passage backwards of gas.

7. Corrosion of pipes and traps, or bad workmanship in joints, will often allow escape of gas.

8. By absorption through the contents of traps, gas is often taken up and given off. Dr. Fergus, of Glasgow, experimented with ammonia, and found it transmitted through an ordinary trap in about twenty minutes.

This may be obviated by having a second main ventilating tube, and these two will form a circulation, (as shown in the tubes A and B in the diagram), preventing foul air from accumulating—stagnant—at the trap.

In a system of house drainage, one of these two tubes may be secured by running a 3 or 4 inch pipe (B) from the sewer, just outside the house wall, up to the roof, clear of cornices, chimneys and windows ; whilst the other will be obtained by continuing the soil pipe (A) up through the roof. A difference of temperature in the pipes will cause the air to circulate through them. The last named pipe (A) will save the traps opening into it from being forced by gas from the sewer and drain. The traps of the baths and lower closet—all traps in fact below the uppermost one—must be saved by their own vents (v, v, v, v,) from being syphoned by sudden liberations of water above. These vents may open into the extended soil pipe above the highest trap.

In the diagram, pipes (k, k, k,) will also be seen rising from a point below the hopper of the closet, a little above the water in the trap. These pipes may serve a double purpose. By branches from the water-closet tanks they may act as flushers to the water-closet traps, and they may also ventilate the water-closets. They may lead to the outer air or to the chimney flue of an isolated kitchen in constant use, but never into a bedroom chimney or any other not used *constantly* in the strictest sense of the word. *And never should any tubes which have direct connection with the drain open into the chimney of a dwelling-house.*

As for the trap shown between the house wall and the street sewer it might be left out, were the system to become generally adopted, (as it should be by by-law), the drain being then carried directly to the sewer as shown by the dotted lines ; for as remarked before, a point away up thirty feet or so above our heads is surely the best place to dis-

charge the gas from our sewers, and not at our feet. But if the plan were not general then it would not be advisable for the individual to make his ventilating tubes the means for ventilating the whole sewer of his street; though even that would be better than ventilating the whole sewer by a grating opposite his hall door and sitting-room windows. The best plan even in a general system would be to leave the trap in the position shown and have a third ventilating pipe (C) running up onto the roof from a point just outside of the trap and between it and the sewer. We would thus lessen the danger of even *diluted* sewer gas finding its way into apartments through corroded pipes or defective plumbing, whilst at the same time overhead ventilation of the sewers would be secured.

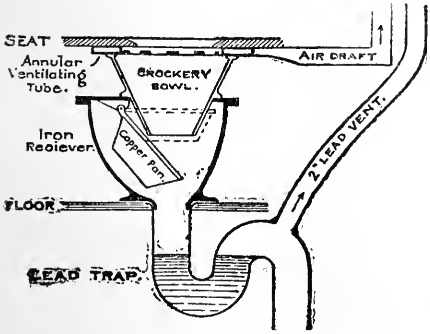
In no case should weeping drains, wastes from refrigerators or other like appliances have direct connection with the drains or drainage pipes of the house.

Dry traps are not to be relied upon, as they do not entirely prevent reflux of gas.

Great care must be taken to prevent the contamination of drinking-water by the gas or "foul air" of water-closets or drains. For this reason closets should be supplied by pipes from a separate tank, and never from the general system of water supply. Epidemics of typhoid fever have arisen from neglect of this caution; and also from contamination by interchange of contents through leaky pipes carrying respectively water and sewage.

Water Closets.

It may be well here to utter a warning against that very common form of closet, the pan-closet, of which a diagram is here shown. The passage from the bowl into the receiver is closed by the pan, holding water and preventing the constant passage backward of gas when the closet is not in use. But when the handle is drawn up the pan is deflected downwards so as to discharge its contents into the receiver, as shown in the diagram; and, as two bodies cannot occupy the same space at the same time, we have forced up from the receiver the gas rendered doubly foul by the repeated coatings of fæcal matter adhering to its wall as it is dropped on to it from the pan.



* Fig. 2.

There are good forms of patent closets, but the simple hopper with a good swirl of water to keep its walls washed clear of fæces whilst in use, and with an occasional flush, will meet every sanitary requirement and will be free from the objections to which many forms of patent closet are open. The hopper should be of glazed earthenware or porcelain; metal fouls more readily. Its trap should be placed above the floor so as not to leave a long tube between the bottom of the hopper and the surface of the water in the trap. This lessens to a minimum the surface for filth accumulation. The trap is also more accessible in case broken tumblers or other impediments should get into it.

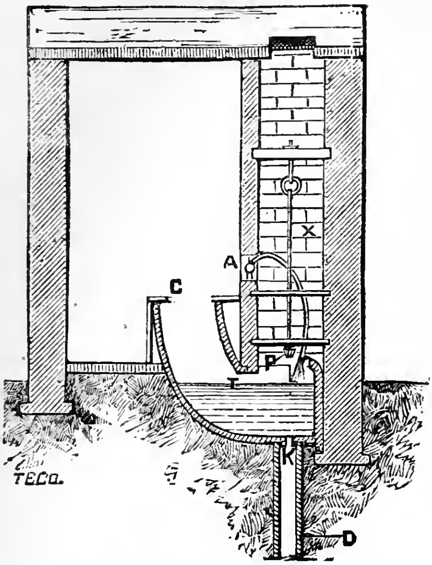
A foul odour often proceeds from the fact of a space being left between the seat and the top of the hopper of water-closets, through which urine or other water may slop over.

Latrines.

It now seems to be no longer a matter of doubt that the water-carriage system may be employed in this country in connection with out-door closets and latrines. In the densely populated districts in which the water-carriage system is established, these should be made to supersede the privy-pit.

When numbers of persons of various classes have to use closets, they cannot be relied upon for care and cleanliness. Hence it becomes necessary to use latrines, which may be attended to by some servant of the corporation, or other person, who shall, from time to time, change their contents, and supply them with water.

Of the various forms of these latrines, the following may be mentioned :—



LIVERPOOL TROUGH-CLOSET.

1. *The Liverpool Trough Closet.*—"This may be described as consisting of a series of closets communicating with a long trough (T), situated beneath and behind the seat (C), which receives the excreta from each closet in the series. The lower end of the trough communicates with a drain (D), leading to the sewer by an opening (K), which is closed by a plug (P). Behind the back wall of the closet there is a small space (X) to which no one has access but the scavenger, and from which alone the plug can be raised by means of a handle. The scavenger visits daily, empties the trough, washes it out with a hose connected with a hydrant, and again charges it with water. As much water is let in as will cover the excreta received during twenty-four hours, and so prevent any smell. The closets are kept clean by the users."

2. *The Bristol Eject.*—"This consists of a strongly constructed dip-trap, interposed between the privy-trunk, as the receptacle is termed, and the drain. It thus admits of the ready extraction of foreign matters which may be thrown in ; it is not easily broken ; and, as it is flushed and kept clean by the servants of the corporation, it is found to answer much better than ordinary water-closets among the poorer classes of large towns."

3. *Other forms of Latrines*, on the same principle, are thus spoken of in Wilson's "Hand-book of Hygiene :"—

"For barracks, prisons, etc., water-latrines of a much simpler construction than either of the above answer exceedingly well. An open metal trough, roofed in, and with the necessary partitions and doors, receives the excreta, while its anterior upper margin constitutes the seat. In order that the excreta may be constantly covered, the trough should be kept one-third full of water. It should also be well flushed at least twice daily, and the contents allowed to run off into a drain connected with a sewer. A plug, or flap-door, at the lower end of the trough will be required to prevent the water from draining off during the intervals.

"There is a further advantage, common to all closets of the trough system, which may here be pointed out. In the event of an epidemic of cholera or enteric fever raging in the crowded courts where these closets are in use, it will be an easy matter to throw disinfectants into the troughs, and thus destroy the infectious power of the alvine discharges."

In some latrines water does not stand in the receptacle, but is admitted daily to sweep out the contents with a sudden flush. Those in which the fæces are received into the water, the whole being suddenly let off and flushed, are to be preferred, where the receptacle can be placed at a depth sufficient to protect it from frost, as is now done with our water-pipes, hydrant-services, and drains, always remembering, however, that the open troughs are more exposed to atmospheric changes of temperature. In this Province out-door water-closets have, in some instances, been introduced, and, when carefully constructed, have been found to work satisfactorily in the winter season. Great care, however, needs to be exercised.

4. In various cities on this continent, so-called "*Iron Sinks*" are manufactured, and are being largely introduced.

In New York the change from the old system to the new is being gradually made. No new pits are allowed to be dug; and when any existing one becomes a cause of complaint, the following order is issued by the Board of Health and must be carried out :—

"That the privy vault thereat be emptied, cleaned and disinfected and filled with fresh earth. That a receptacle, vault or sink be constructed thereat, of a depth not greater than two feet, which shall be impermeable and secured against any saturation of the walls or ground, and shall be connected at the upper end with the Croton water, and at the lower end with the street sewer, and provided with an outlet at the lowest point and on the bottom so as to admit of the complete discharge of the contents and of being daily flushed with water. The bottom thereof shall be so inclined that at the lowest point the outlet shall be at least six inches below the lowest point at the opposite end."

In these privy sinks the hopper and trough are all in one piece. They are similar in principle of construction to the trough-closets above noticed. They are very moderate in price, one with two holes costing about $15.00; with three holes, $20.00, and so on in proportion.

Some places, such as factories on the course of our largest rivers, may be so favourably situated as to allow of troughs with a continuous stream; but extreme vigilance, as regards outfall, must be exercised in connection with this practice. Numerous cases of drinking water polluted by excrementitious sewage have come under the notice of this and other Boards.

Urinals.

Urinals become offensive through want of proper provision for preventing the incrustation of them with deposits from the urine, and of proper means of frequently cleansing or removing surfaces which collect the droppings. A tray of ashes or sawdust in front of, and beneath, the urinal will meet this latter requirement, the contents of the tray being frequently changed. For the first mentioned cause of offensiveness, it seems necessary to have a flow of water washing the urinal, whilst in use. Disinfectant contrivances should also be used.

Intercepting Tanks.

In many places where the natural facilities for outfall are not very good, the mixed contents of sewers are received into tanks, the solid portions allowed to settle, the liquid portion removed and disposed of in the methods described in connection with liquid refuse in the first part of this pamphlet, and the solid settlings also removed, mixed with earth, ashes or chemicals, and used for manure.

The following works have been consulted in the preparation of this pamphlet:—

Report of Massachusetts State Board of Health, 1876;
The Sanitary Drainage of Houses and Towns (Waring);
Parkes' Practical Hygiene;
Wilson's Hand-book of Hygiene;
Williams on House Drainage and Water Supply;
Baldwin Latham's Sanitary Engineering.

To the Members of the Provincial Board of Health:

Gentlemen,—Your Committee on Sewerage, Drainage and Water Supply begs leave to submit the accompanying pamphlet "On the Disposal of Sewage" in accordance with instructions received at the last meeting of the Board.

(Signed) Wm. Oldright,
J. Galbraith.

The pamphlet was considered in Committee of the Whole, adopted, and ordered to be published, 11th May, 1883.

APPENDIX E.

Article I.

REPORT OF THE COMMITTEE ON THE DONCASTER KNACKERY AND FAT-RENDERING ESTABLISHMENT.

To the Chairman and Members of the Provincial Board of Health:

Gentlemen,—Having been requested by the Chairman, I proceeded to the manufactory of Messrs. Hallet, Doncaster, situated on the brow of the height overlooking the valley of the Don, and at about two hundred yards from the public road which passes through the village. I found one of the owners of the works, Mr. Vincent Hallet, who, when I informed him of the purpose of my visit, very courteously offered to show me over the premises, and give me detailed information of the work done.

In order to present the matter to the Board in some methodical manner, I shall take up the various points of my enquiry in detail.

I. *Raw Materials Employed.*—In the establishment, which has been in existence some three years, the following materials are utilized:—

1. Offal from slaughter-houses, such as the heads, feet, bones, etc., of cattle and sheep.
2. Bones from retail butcher-shops.
3. Animals that have died.
4. Tallow unrendered and rendered.

The products which result from these materials are, as is evident, of the following classes:—

1. Fats and oils which include the tallow of cattle and sheep, the lard of pigs, and the oily product known as neatsfoot oil.
2. The glue stock, which includes the remains of horns and hoofs, after boiling.
3. The flesh or muscular and connective tissue portions of the animals.
4. The bones.
5. The fragments of hide, wool, etc.

These details having been obtained, I next proceeded to the building to investigate the methods by which the various products are obtained.

Entering the building, which is wooden, I found it to be composed of four flats. In the lowest are situated boilers from which proceed pipes which are used to convey the steam into the various vats, which are situated on the second flat in part, and in part swing on an axis between this and the one below.

These are all composed of wooden staves bound together by hoops, like barrels.

Two of them are used for boiling the remains of horses which have died, each of them being capable of containing four carcases when cut up; five are used for boiling the feet, bones, etc.; and three are employed for the *rendering* of tallow, etc.

On the floor in a portion of this flat were lying the remains of heads, horns, feet, offal, etc., freshly received from the butcher shops and slaughter-houses, and over them some lime had been thrown. In another portion of this flat were large quantities of bones and horns, dry and ready for shipment.

Barrels of products were standing by, which included neatsfoot oil and rendered tallow, ready for shipment to Messrs. Morrison & Taylor, who manufacture soap.

The floor of such portions of this flat as are near the vats is made of planks laid several inches apart. The reason for this is as follows: After the boiling of the various materials in the vats, during which the fats and oils gradually come to the surface of the water and are skimmed off, the vats are upset, the bones, horns and flesh remaining on

the floor, while the infusion, which necessarily contains much extract of the meat, drains through and is allowed to pass down the gully which runs towards the Don.

The next flat is used partly in connection with the vats, while another part is employed as a drying room for the glue stocks, the smoke funnel passing through the room and the one above it, which is used for a drying room for hair, wool, etc.

In the yard surrounding the building was seen on one side a waggon loaded with raw materials ; a vat in which were fragments of hide, etc., being cured by quick-lime thrown on them ; an amount of glue stock spread out in the sun to dry ; in the rear of the building was a heap of sheep's heads from which the flesh was partially eaten or had rotted away, but with fragments of skin and wool still clinging to them ; and in the gully already mentioned was the remains of the flesh extracts from which the water had either drained away or evaporated, and the end of a box drain, obstructed with similar dried-out material.

Such, then, is the manufactory as seen by your Secretary ; and the question which presented itself was : Is the manufactory as carried on a nuisance of such character as to imperatively require attention on the part of this Board, should the Local Health Officers prove either incapable or lax in the performance of their duty ?

Of course the questions, necessary to be determined are first, what constitutes a nuisance ? and, secondly, is it such to the degree of demanding immediate and permanent remedy ?

Blackstone defines a nuisance to be : "Anything which worketh hurt, inconvenience or damage." According to Mansfield, to constitute a nuisance it is enough that the matter complained of renders the enjoyment of life and property uncomfortable. But a nuisance under the Sanitary Acts of Great Britain *must be one which is injurious to health.*

Now that the matter complained of is a nuisance under the first two definitions is evident from several facts :

1. That a person while driving along the public road some 200 yards away, perceives an extremely disagreeable smell should the wind be blowing from the manufactory.

2. That a number of houses in the village are situated between the road and the manufactory.

3. That the proprietor of the brick kiln some 200 yards south from the manufactory, stated that several workmen left his employ on account of the odorous emanations from the manufactory.

4. That the nuisance is one injurious to the public health is a matter somewhat difficult of proof ; but inasmuch as it is stated by Dr. Ballard in his report to the Local Government Board on effluvium nuisances, that fat-rendering establishments are very generally considered nuisances by the sanitary authorities there, we may fairly conclude that this establishment, in which much more objectionable materials than are often used in similar ones in Great Britain are employed while the precautions taken are very few, must constitute a nuisance fairly within the meaning of various clauses of the Health Acts of this Province.

Such then being the case, it became a matter for consideration what methods should at once be adopted for the removal of the *nuisance.*

I shall refer to the various points in order :

1. Disposal of raw materials :

There would seem to be no difficulty concerning the fresh offal from slaughter-houses, and the remains of flesh, feet, etc., from the butchers if, as Mr. Hallet stated, they are placed in the vats and boiled the same day on which they are brought to the factory.

But it may well be that the material when brought there is not always fresh, as Mr. Hallet confesses is often the case with animals, such as horses, that have died. These, however, he states, are cut up and boiled immediately on arrival on the premises, although he states that such was not the case during the winter as the material obtained was in excess of the manufacturing facilities. There were no such remains of horses on the premises at the time of my inspection.

I impressed upon Mr. Hallet the absolute necessity of complying with this condition, which he says is at present the case excepting on Sundays. I saw nothing which led me to conclude that the facts were other than he stated.

2. Precautions during boiling:

Inasmuch as some of the raw material, such as soap-grease, dead horses, etc., are in a more or less putrid condition when brought to the manufactory, and since during the boiling of such, offensive vapours consisting, according to Dr. Ballard of:

(1.) Offensive vapours smelling of the materials used;
(2.) Of sulphuretted hydrogen;
(3.) Of possibly small amounts of an intensely acrid reduction product from the glycerine of the fats, named *acrolein*;
(4.) Hydrocarbonaceous odours;

it became necessary that I should recommend that the vats be covered (which could be much more thoroughly done were they made of iron), and that the covers have pipes leading from them, by which the bad-smelling vapours might be carried away and condensed in a manner similar to that employed in the oil and fat refining manufactories of Great Britain. By this means a certain amount of fat is saved which will in some degree repay for the trouble taken.

Should it be preferred, the pipes, instead of leading to condensing tanks, may deliver their vapours into the draught of the furnace, and thus have the odorous materials destroyed.

Management of By-products:—Nothing need be said concerning the neatsfoot oil, tallow and lard, which are the products of manufacture. But of the by-products the one which apparently is the source of a great part of the ill-smelling odours is the fluid extract—if I may so call it—or the water which remains in the vats after boiling and after the fats and oils have been skimmed off.

The water, as already mentioned, is allowed to run through the floor into a refuse room, thence from the building down the gully, presumably in a drain; but the drain only runs some 20 yards from the building and was apparently blocked up.

The consequence is that the water soaks away or evaporates, and the more or less solid extract remains on the soil decomposing in the sun and giving off extremely offensive odours. I would suggest that such water be rapidly carried from the building by a covered drain into tanks; and that it there be precipitated by some substance, such as quicklime, and the clear water thereafter allowed to drain away. Were two such tanks built, they might be used alternately and solid materials taken out and utilized as manure.

The solid remains left as by-products are, as already mentioned, of three classes:

1. Glue-stock.—This is not of such a character, apparently, as to create any nuisance, the hoofs and horns being exposed in the drying kilns already mentioned.

2. The flesh or muscle and connective tissues, which fall off the bones after boiling.—This material, from which all the fatty products have been removed, is that which in similar manufactories in Great Britain is pressed into cake and under the name of "greaves" is used either for food for dogs, readily sold, or as manure. I was informed that it is taken away almost daily from the manufactory and used for manure. There was not any of it remaining at the time of my inspecting the premises. It will readily be seen how necessary it is that this material be immediately taken away. Along with this there are also the contents of intestines, and other refuse, thrown into the refuse room, and which likewise are said to be removed daily.

As is well known to the Board, the local health inspectors took action against the Messrs. Hallet, a few weeks after my visit; and subpœnaed me to give evidence. After the preliminary trial before two justices of the peace, the case was sent to the County Court, and the indictment made out against the Messrs. Hallet for a nuisance arising from the vapours coming from their factory. Having been again subpœnaed, I gave evidence before Judge McDougall, and after other witnesses were called, the case went to the jury, who brought in a verdict of guilty.

Judgment was reserved in order that the defendants might have time to complete improvements they had undertaken.

I was asked by Messrs. Hallet to visit the premises in the beginning of December, and also in the beginning of March to examine the improvements made. The arrangements for preventing malodorous vapours arising from the tanks, consist of a funnel-shaped

galvanized-iron cover for each tank, from which runs a pipe of the same material to a horizontal pipe of the same material, but of larger size, which runs with a slight incline to the end of the boiling room. Thence it descends as a vertical pipe to the edge of the furnace where, by an offset, it is carried into the ash-hole under the furnace. It will thus be seen that a very thorough contrivance is constructed whereby the volatile effluvia, coming off in the vapour from the tanks, are drawn into the draught of the furnace and there burned. In regard to these arrangements very little would seem to be desired. Regarding the drying rooms the odours, while not pleasant, are but limited in intensity and are not likely to cause any public nuisance. The disposal of the refuse and boilings from the tanks is not at present a nuisance owing to the cold; but these are likely to become a further source of complaint if not properly treated. I have suggested, and it is about to be carried out, that the refuse room be divided into two tight compartments, lined with galvanized iron on the floor and sides, to be used alternately as receptacles for the refuse. Further, a revolving barrel will be conveniently placed so as to deliver its contents of *milk of lime* into either vat at pleasure.

Now the process to be carried out is briefly this: One day one compartment will receive all the fluid extract from the vats drawn off from the bottoms of them, from which the solid matters will afterwards be removed. The albuminous materials of the solution will be precipitated by *milk of lime*, and allowed to stand twenty-four hours. The clear water will then be allowed to run away through the drain to the river, and the precipitated materials will be removed. The next day a similar process can be carried out with the materials which have been run into the second compartment.

If these arrangements are completed I believe that the Hallet Manufactory can be carried on in such a manner as not to create a public nuisance.

All of which is respectfully submitted. P. H. Bryce.

Article II.

REPORT OF THE COMMITTEE ON THE LESLIEVILLE KNACKERY AND FAT-RENDERING ESTABLISHMENT.

To the Chairman and Members of the Provincial Board of Health:

Gentlemen,—Complaints at various times having been made to the Board concerning a nuisance arising from this establishment, I suggested to the Local Health Inspector, Mr. Young, to enquire into the matter. As, however, legal proceedings were instituted against the proprietors shortly afterwards, I was requested by the High Constable of the county to examine into the nature of the nuisance complained of so that my evidence might be used in Court if thought necessary by the Crown Attorney.

In consequence of this request I visited the premises and made a thorough examination of them.

The character of the manufactory, while being in many respects such as the Hallet one, seems to be different in some respects as regards the raw material used. They use the butchers' refuse and the offal from the slaughter-houses and shops, and the refuse from several of the large hotels in the city. Whatever else they may have used at previous times, there was no evidence of other raw material at the time of my visit. The manufactory is quite near the proprietor's residence, and is kept with much care, so that the odors from it may not be any more disagreeable than is possible. The vats in which the materials are boiled are not covered with hoods with pipes attached for drawing the odorous vapours into the furnace draught. The fluid extract from these vats is carried away into troughs and used to feed pigs, there being at times two or three hundred on the premises. The more solid material of the vats is put into a press and the fluid extracted and drained likewise into the pig-troughs. The solid material from the presses, I understand, is taken

away and used as dog food or manure. A certain amount of the boilings (I presume of the most offensive kinds) are allowed to drain into a vat on a waggon and daily carted away, and allowed to flow over a sandy field, on to which, in addition, are carted the portions of offal which it is not thought worth while to boil. These materials, I was told, are ploughed under daily. The tank on the waggon is a clumsy, dirty contrivance, inasmuch as the fluid slops over it, and a certain amount adhering undergoes decomposition and becomes very offensive. The remains of fluid materials, after having been utilized to the satisfaction of the pigs, drains into a small stream which runs from near the pens into a larger stream running through Leslieville. This stream has been much complained of. A large heap of flesh, bones, etc., was seen in the field at a little distance from the house. It was very probably at one time a great nuisance; but as it had lain there a year or two, had undergone decomposition and was, moreover, covered with earth, it was not a nuisance at the time of my visit. Some glue-stock, and some flesh materials, bones, etc., which had been treated with sulphuric acid or carbolic acid, were likewise found stored up or laid out in the sun to dry. It will be seen that there are abundant conditions present on the premises tending to create nuisances, and which, unless great care is exercised, will certainly do so. As I was not called to give evidence by either the prosecution or the defence in the case before the courts; as the jury disagreed, and as the case is still before the courts, it would be unwise that any more extended report on the case be made at the present time.

All of which is respectfully submitted.

P. H. Bryce.

Article III.

REPORT OF AN INTERVIEW BETWEEN THE CHAIRMAN OF THE PROVINCIAL BOARD AND THE COUNCIL AND RESIDENTS OF RICHMOND HILL REGARDING CERTAIN NUISANCES.

As a sample of conditions to be found in many municipalities of this Province, the following is reported:—

During the month of August letters were received from several residents of Richmond Hill, complaining of nuisances in that village. These complaints were made the subject of correspondence between this Board and the Reeve. No practical result having followed, one of the residents referred to called upon the Chairman and requested him to come out to Richmond Hill with a view to having the nuisances abated. It was therefore arranged that the matter should be brought up at the next Council meeting, at which time the Chairman would go out to the village. It was further arranged that the various persons interested or who could give evidence should be present at that meeting. Of these there were about fifteen.

One cause of complaint was a bone yard in which were accumulated bones gathered from the village and surrounding country. Oftentimes portions of flesh were left adhering to these, and occasionally carcases and parts of carcases were brought to the yard. It was said that sometimes the flesh was removed by burial in a manure heap, and that when it had rotted off, the heap was opened and the bones removed, producing a very disgusting and injurious odour. It was also stated that, on some occasions, the flesh had been removed by boiling in the open air on, or close to, the street. The evidence of several persons seemed to support the truth of these statements. It was understood that the Reeve and other municipal authorities would see that the nuisance caused by this yard should be abated.

Complaint was also made of the manner in which two butchers carried on business. Both were members of the council. One of them stated that the floor of his slaughter-house is double planked and that the blood is conducted to a water-tight tank and removed with the entrails after each slaughtering, and that the premises are thoroughly cleansed.

The evidence adduced did not appear to disprove his statements. In the other case several persons testified to offensive carelessness. The councillor admitted that he sometimes killed smaller animals at his shop, close to the main street of the village, but expressed his willingness to discontinue this practice, and to keep his establishment in a manner consistent with his position as one of the health officers (under the Act of 1873).

During the evening the Chairman made a short address in which he showed the saving and benefits which would result from a proper system of sanitation, pointed out some of the features comprised in such a system, gave illustrative examples, and urged the formation of a Local Board of Health.

The Reeve and other citizens referred to sanitary awakenings that had taken place at times. A by-law was produced which had been passed in 1874, under the reeveship of an elderly gentleman present, Mr. Wm. Harrison. It provides that the Fire and Nuisance Inspector shall also be Inspecting Health Officer, and that he shall "assist the health officers" in making inspections of premises containing anything prejudicial to health. It also provides for the cleansing of streets and premises. One provision, however, is that the Inspecting Health Officer be paid "at the rate of one dollar per day while on duty under the written orders of the said health officers." It can readily be seen how this arrangement would interfere with the satisfactory carrying out of sanitary inspection and work dependent upon it. The Inspecting Officer showed how the performance of his work had been made very unsatisfactory through lack of support and encouragement, and through the non-existence of a board of health proper.

The Chairman gave many reasons why the sanitary work of a municipality could not be satisfactorily carried on except by a board of health appointed for that purpose—most of which reasons have been stated in various portions of this Annual Report. Amongst such reasons he alluded to the fact that there are so many other subjects which must demand the first attention of the council and prevent it from giving the necessary consideration to matters relating to public health; also to the fact that such matters require special study and a special interest in regard to them, and that there was no certainty that gentlemen seeking election to a council had made those matters an object of special study, however well informed they might be on other subjects.

It is hoped that the evening thus spent was not altogether unprofitable, and it is a matter of regret that there is not sufficient provision whereby interviews with local boards of health and municipal officers throughout the country could be more frequent and general.

Article IV.

REPORT ON THE CONDITION OF ASHBRIDGE'S BAY, BY THE COMMITTEE ON THE DISPOSAL OF SEWAGE, OF THE PROVINCIAL BOARD OF HEALTH.

To the Members of the Provincial Board of Health:

Gentlemen,—Your Committee on the Disposal of Sewage, to whom you have referred the above subject, begs leave to report:—

The questions now at issue regarding the influence on public health of the cattle byres at the east end of the city, are divisible into two:—

1. The extent to which the excreta pollute the waters of Ashbridge's Bay, and the sanitary effect of this pollution.
2. The extent and effects of effluvia arising *directly* from the establishment.

1. By a reference to the map which hangs on the wall of your Board Room you will more plainly see the size and surroundings of Ashbridge's Bay. You will observe that it is a long, narrow body of water; that the portion marked as open water is, by measurement on the map, about 2,000 yards long and 700 yards wide. That about an equal area is occupied by marsh, intersected by channels. That the greater portion of

this is situated at the western end, between Ashbridge's Bay and the Harbour. That Ashbridge's Bay is shut off from the Lake on the south by a sand bar, and that to the north of it are situated the portion of the City before referred to, and the villages of Riverside and Leslieville. The sand-bar first mentioned is represented on the map with a slight shallow gap—but with the shifting of the sand this was closed at low water during the last year. The water of this bay is very shallow, and it will be seen presently that around the point of outfall it can be readily fathomed with an oar. In many other places, and over larger areas, it is much more shallow; the quantity of water is of course still further diminished by the bodies of marsh above described.

A member of your Committee, Dr. Oldright, having received a courteous invitation from Mr. Gooderham to visit the byres, your Committee is the better enabled to state exactly what passes from them into the bay. The cattle are tied in long rows, behind each row is a long channel down which runs the mixed solid and liquid excreta, emptying into a large *open* box-drain or ditch, outside the byre. In this ditch the excreta are allowed to settle, and when settlement has taken place the surface fluid is allowed to run off into the main drain, hereafter to be described. A man then wades along the ditch and shovels out the more solid portion, which he throws onto a boarded platform whence it is frequently removed by waggons. The remaining liquid portion is then allowed to escape into the main drain. This large drain or sluice conveys two emptyings of liquid manure (as above described) into Ashbridge's Bay. During a large portion of the year it flows down a hole in the floating bog before reaching open water; sometimes this hole becomes choked and it then flows on to the open water. Your Committee cannot, however, see that this point has much bearing on the result, as the liquid manure, no doubt, finds its way into the confined waters of the bay in either case.

Now, considering the very large amount of this mixed liquid sewage given off by 4,000 head of cattle, (the number usually kept at the byres), the confined, land-locked condition of Ashbridge's Bay, and the shallowness of the water, it would seem to your Committee that there can be no difference of opinion amongst sanitarians as to the result that must ensue—that a condition must be produced highly prejudicial to health and comfort.

This opinion has received confirmation by the evidence of those who have visited Ashbridge's Bay. The sickening odour which arises while paddling through the waters, more especially in the vicinity of the point of outfall of the sewage referred to, is a matter of notoriety amongst sportsmen and others. But for more specific information your Committee would state that it has been informed by a medical gentleman who has paid much attention to the subject, on account of his interest in sanitary matters, and who has no other interest to serve, that he visited the locality last summer, that the stench was then very disgusting, that all around his boat gases emanating from decomposition would bubble up accompanied by masses in which he felt no hesitation in saying that he could see decaying manure. Later in the season a member of your Committee (Dr. Oldright) was requested by the Medical Health Officer of Toronto, to accompany him on a visit to the locality. On the occasion of this visit the same ebullition of gases, with particles of manure, was observed in the neighborhood of the outfall, though in a smaller area than that described above, and the day and season being cold and windy the offensive odour was not so perceptible except when portions of the bottom were scooped up by the oar, the water here being about five feet deep.

2. In regard to *effluvia* arising directly from the establishment itself. These are frequently complained of by persons residing on, or passing through, the streets and roads in the neighbourhood. It is urged by the proprietors and others interested that the bad smells so complained of arise from other establishments in the neighbourhood and are incorrectly attributed to the byres.

But whilst there is no doubt that there are smells arising from other sources in the neighbourhood, which are more intensely disgusting, intolerable and prejudicial to health than those arising from the byres, still it has been noticed by many persons, amongst others by members of your Board and Committee, that a peculiar, strong, sour odor, such as is noticed from vessels used for the transmission, storage and feeding out of distillery slop, frequently comes from the direction of the byres; the peculiarity of

the odor, and the fact that when noticed a gentle wind has been blowing towards the observer from the direction of the byres, and not from the direction of these other establishments, prove that this particular odor arises from the cattle-feeding establishment. And the fact that other nuisances exist and should be attended to does not lessen the necessity for abating this odor.

A further argument in defence on the part of the proprietors, is the cleanly condition of the premises themselves, and the fact that very little smell has been noticed on the occasion of the visits of various persons to the establishment. By the courtesy of Mr. Geo. Gooderham, and in reponse, indeed, to a pressing invitation from him, the member of your Committee before referred to is one of those persons who have made such visits, and can bear testimony to the care that is taken in keeping everything on the premises as clean as possible. The arrangements for the distribution of the slop and for flushing the premises are good. But it is a fact well-known to, and frequently commented upon by, Health Officers in Great Britain and elsewhere, that it is often the case that odors which rise from offensive premises, and which are wafted in bulk so as to be very disagreeable and offensive at a reasonable distance from such premises, give rise to but trifling disgust or annoyance on the premises or close to them. This remark may be found in some of the Reports of the Local Government Board of Great Britain. The day of the visit referred to was very soon after the opening of the byres, and it was a cold and very windy day, and very little odor was noticeable, though from some of the unused vats there was some sourness. But it would impress us very little to know that a trifling smell on the premises was its usual condition.

From all that is herein reported your Committee considers that those who complain of the cattle byres as "interfering with the enjoyment of life and property" in the neighbourhood, and as producing conditions prejudicial to health, have good ground of complaint.

All of which is respectfully submitted.

WM. OLDRIGHT,
Chairman.

SCHOOL OF PRACTICAL SCIENCE, TORONTO,
30th Nov., 1883.

DEAR OLDRIGHT,—

I have carefully read over your report, and heartily concur in it.

Yours sincerely,

J. GALBRAITH.

The report was received and adopted by the Board on the same day (30th Nov., 1883).

ARTICLE V.

REPORT OF A COMMITTEE APPOINTED TO REPORT ON THE SMOKE NUISANCE IN THE CITY OF TORONTO.

To the Chairman and Members of the Provincial Board of Health.

Gentlemen,—This Committee, having been appointed at your last quarterly meeting to ascertain whether any means could be taken to remove or mitigate the smoke nuisance in Toronto, begs to report as follows :—

1. There can be no doubt that smoke and soot are disagreeable to the eye, spoiling the natural clearness of our Canadian sky, and adding materially to our ever increasing store of dust.

2. Although smoke-laden air is decidedly unpleasant to breathe, yet the air in the lower portion of the city is almost always smoky, and when the wind sets in in certain

directions those who live in the vicinity of factories are disgusted by the presence of black smoke rolling in through their doors and windows. Owing to the fact that smoke does not ascend well on the rarefied air of summer, it so happens that we suffer most from this nuisance at the season of the year when we are most anxious to open our windows. Coal smoke is also injurious to vegetation and the growth of trees. This fact, which has been noted by English observers, is due to the large quantity of sulphur acids let out into the air by the combustion of coal. The leaves of trees exposed to coal smoke fall about a month sooner than the leaves of trees not similarly exposed.

Mr. D. B. Hewett, in his evidence taken in 1877 before the Royal Commission on Noxious Vapours, says:—"On 27,000 tons of coal, we burn off on an average 1.5 per cent. of sulphur, equal to 405 tons, less 40.5, for 1 per cent. of sulphur in the 4050 of cinders and refuse. Therefore, we send off in this way 364.5 tons of sulphur up three large chimneys. That is, we pollute the air $13\frac{1}{2}$ times more with the sulphur of the coal we consume than with the sulphur escaping from the manufacture of sulphuric acid. I know that for thirty miles around Manchester you cannot collect the leaf of a tree of any kind without your features being perfectly blackened with carbon. I know also that those engaged in threshing corn find the straw is covered with the soot of coal smoke, and wherever this soot is found there is also found to be present the sulphur acids of the smoke. The smoke is diluted, and that saves the corn; but we find that whenever it is not diluted and passes on to the corn in a strong state, at a low level, especially during the blooming of the corn, it does damage."

R. A. Smith, Ph.D., F.R.S., in his evidence before the same commission, states in reply to the question, "Do you trace much mischief to property or health from the escape of coal smoke?" there is a very large amount of destruction of trees to be traced to coal smoke."

It must be stated, before going further, that the quantity of sulphur acids let into the air *is* greatest when the combustion of the coal is most perfect and the smoke colourless.

Black smoke contains but little sulphur. The ash of the coal retains the sulphur in combination with the bases until the combustion is nearly completed, and most sulphur is given off from a red fire.

Mr. Hewett states, "I have found, on analyzing the chimney gases, that colourless smoke contains more sulphurous acid than black smoke."

One inference from these premises is that, while black smoke is more disagreeable to the senses of sight and smell, and more dangerous to the lungs, colourless smoke is more destructive to vegetation.

With regard to the influence of coal smoke on animal and human life there is a difference of opinion: Dr. B.W. Richardson, of London, England, an eminent physiologist, in his evidence before "The Royal Commission on Noxious Vapours," already alluded to, expressed the opinion, that coal smoke had no effect whatever on animal or human life. On the other hand, Dr. John Spear, medical health officer for South Shields, Jarrow, and Hepburn, stated, before the same committee, "Smoke taken into the lungs irritates and inflames the small tubes and air cells—at every time of fog, in London, when the smoke is brought down, an excessive mortality from lung diseases is at once recorded."

In his summary of statistics, he says, "that black smoke and the products of coal combustion are prejudicial to health."

Dr. Geikie, Professor of Medicine, in Trinity Medical College, Toronto, in reply to a letter which I addressed to him, asking his opinion on the influence of smoke-laden air in producing disease or exercising an unfavourable influence on already existing disease, replies as follows: "I don't think it necessary to go further than to say that it is most sensible to secure the highest possible degree of purity in the air we breathe, and that there can be no doubt at all, although it is difficult to prove the point by actual facts or figures, that an atmosphere more or less charged with coal smoke is prejudicial to health. For, without producing actual disease, this impurity is really so much of what might be called poison in the air, and must do harm. And injury to health from a cause, slight but constant in its operation if it be not capable of causing marked illness, does reduce the general vigour and disease-resisting power of the system. I am strongly in

favour of having the air we breathe in our city kept as free as possible not only from coal smoke but from every other impurity."

Mapother, in his lectures on public health says:—"The emission of smoke from factories is most injurious to health by obstructing sunlight, which is essential to the development of the human body; by the entrance of sooty particles into the lungs, and by compelling the room-keepers in the vicinity of these factories to keep their windows closed, so that they suffer from a total want of airing."

Before leaving this part of the subject, I would remark that, if there be force in the contention of Dr. Lombard, President of the International Sanitary Congress, held at Geneva in 1882, in favour of pure mountain air in the treatment of consumption, it follows that the smoke-laden air of manufacturing towns cannot be breathed with impunity by persons predisposed to, or already suffering from, consumption or allied disorders. And seeing that mountain air is unattainable here, Toronto being only 300 feet above sea level, it behooves us to endeavour to secure the other part of the recommendation—*i.e.*, the greatest possible purity of the air we breathe. Not that we should put any undue pressure on the manufacturers, but simply that we should oblige them to prevent pollution of the air, as far as practicable, by the use of such means as have been proved sufficient to accomplish the desired result.

What are the methods of getting rid of the smoke nuisance?

The best method is to make it obligatory on the manufacturers to burn hard coal. It costs very little more than soft coal, is cleaner to handle, and, if reasonable precautions are taken, is not more severe on the boilers. As an evidence of the truth of this last assertion I have been told by a reliable authority that the boilers of the heating apparatus at the Normal School here have been in use for nine successive years. Hard coal is used, and the boilers are considered by my informant to be as good as when they were first put in. If this plan were generally adopted the amount of the sulphur acids sent into the atmosphere would be larger than at present, but we would be spared the black smoke nuisance. In some engine shops in the United States anthracite coal alone is used, and after the stokers become properly trained no difficulty is experienced. In the course of my enquiries I found an engineer in the city who used anthracite exclusively. His engine was of 15-horse power, and was used in a populous neighbourhood. It caused no nuisance, and gave complete satisfaction to his employers. But, admitting, for the sake of argument, that soft coal is the cheapest and best fuel for a furnace, can the smoke nuisance resulting from its use be mitigated? It can; but we are left at the mercy of the stokers.

Mr. H. E. Falk, an English salt manufacturer, in his evidence before the Royal Commission on Noxious Vapours, 21st February, 1877, says: "I can make a perfect combustion, and I can make salt, without the chimney smoking; but I must stand by, and I must see that the fireman exactly regulates the admission of air. It is the old difficulty with the black smoke, all the country over, and all the world over. Question—Do you then think that what applies to the salt trade applies generally to the stoking of furnaces? Answer—Quite so; every stoker can avoid black smoke if he chooses.

R. A. Smith, already quoted, says:—"Smoke from furnaces which burn coal may be easily reduced. A great part of the black stuff which goes into the air is caused by bad stoking. Works may be so conducted that no black smoke is emitted at all. It was once proposed to cure all the black smoking chimneys by giving the stoker an extra wage, but stokers got tired of this, and they will not do it, and they cannot be induced to do it. That is one of the difficulties.

The following directions to stokers, which I find at page 59 of Mapother's lectures on Public Health, indicate, in a practical way, the means which must be adopted if the smoke nuisance from factories is to be effectually prevented.

1. No black smoke ought to issue from the chimneys of the furnaces.

2. To prevent this, when charging the furnace push most of the red coal to the back of the furnace and spread the remainder evenly to a depth of not less than three inches, and place the fresh fuel upon the red fire nearest the door.

3. The pieces of fresh fuel must not be larger than the fist, nor added in such quantities as to choke the furnace, as this prevents a sufficient quantity of air from entering, and thereby wastes the fuel and causes smoke.

4. If black smoke issues from the chimney of the furnace, it must be your fault, and a fine will be therefore inflicted. When, however, it does occur, open the furnace door, stir up the black coal and bring it in contact with the red fire.

For any power up to 18-horse power, a gas engine is more economical than a steam engine, and wherever it is used the smoke nuisance is quite obviated.

A number of devices, more or less complicated, have been at various times introduced to the notice of the public with the object of preventing or mitigating the nuisance. For the purposes of this Report it is not necessary that mention should be made of any or all of these contrivances.

From experience gained in England, we have learned that where soft coal is burned special care on the part of the stokers will prevent the black smoke nuisance. We have also seen that the use of anthracite will prevent it altogether.

If, in the public interest, it is thought advisable to abate this nuisance by legal enactments it will be to the interest of the manufacturer to secure the desired result in the simplest, cheapest and most effective manner.

In England the smoke nuisance was specially legislated for in the "Sanitary Act" of 1866. In this Act we find, Part II. Sec. XIX. :—"The word 'nuisance' under the Nuisance Removal Acts shall include 'any fireplace or furnace which does not, as far as practicable, consume the smoke arising from the combustible used in such fireplace or furnace, and is used within the district of a nuisance authority for working engines by steam, or in any mill, factory, dye-house, brewery, bakehouse, or gas-works, or in any manufactory or trade process whatever: any chimney, not being the chimney of a private dwelling, sending forth black smoke in such quantity as to be a nuisance.'" Two provisos are added to this clause. The first states that in places where at the time of the passage of this Act no enactments were in force against the smoke nuisance, the Act shall not come into operation for one year." The second proviso states that "the justices may dismiss a complaint if they are satisfied that such fireplace or furnace is constructed in such a manner as to consume as far as practicable, having regard to the nature of the manufacture or trade, all smoke arising therefrom, and that such fireplace or chimney has been carefully attended to by the person having the charge thereof." The Public Health Act (Imperial) for 1875 reaffirms these clauses.

In Canada we have not had so far any legislation on the smoke nuisance. But occasionally, when great inconvenience from the smoke has been experienced by individuals residing in the vicinity of factories, action has been brought in the courts to restrain the individuals who were guilty of the offence. Thus in Cartwright *v.* Gray (*vide* 12 Grant's Chancery, p. 399) action was brought by the plaintiffs on account of the annoyance they suffered in their houses from the smoke, sparks and noises produced in the working of a steam engine belonging to the defendant Gray. In giving his decision on this case, Vice-Chancellor Mowat concludes as follows:—"My opinion on the whole case is that the defendant has a right to use steam for propelling his machinery, but is bound to use such reasonable precautions in the use of it as may prevent unnecessary danger to his neighbour's property from sparks, and unnecessary annoyance or injury to them from the noise or smoke; that though he seems, since the bill was filed, to have performed this duty as respects these sparks, and noise he has done nothing in respect to the smoke, and that the plaintiffs' complaint in reference thereto is well founded. The decree will therefore require the defendant to desist from using his steam engine in such a manner as to occasion damage or annoyance to the plaintiffs or either of them, as owning or occupying the houses mentioned in the bill." For further information on the legal aspect of the smoke nuisance question reference may be made to Smith on Nuisances, and Wood on the Law of Nuisances.

All of which is respectfully submitted. J. J. Cassidy.

Article VI.

CORRESPONDENCE REGARDING SAW-DUST DEPOSITS AT PARRY SOUND.

The following correspondence on the above subject may be very appropriately introduced as a sequel to the reports in connection with the same matter taken up last year by the Madoc and Coboconk commission.

It will be seen that the writer is seriously afraid of what is likely to follow the decay of large collections of saw-dust, and with commendable zeal urges upon the Board that action be taken. The remarks contained in the report above referred to, are most applicable here:—

Parry Sound, 31st July, 1883.

P. H. Bryce, Esq., M.D.,

Secretary Provincial Board of Health, Toronto.

Dear Sir,—I beg leave to draw your attention to a prospective condition of things which, if permitted, will, I conceive, be, from a sanitary point of view, a disgrace to our times.

This village (Parry Sound) is what may be called a "lumber village." It is built on (for the district) a tolerably level piece of ground, which is cut in two by the river Seguin. The present river-bed is very much contracted, compared with what it was in former times, and now a flat of land extends from the water's edge on one side to what was formerly the steep bank of the river. Some four or five years since, the space from the present water's edge to the former precipitous bank of the river, was filled up by a vast deposit of saw-dust. On this deposit of saw-dust, which covers, to a depth of from ten to fifteen feet, an area of upwards of an acre, *eight frame houses are being built.* A hole dug in the pure saw-dust on the site of each house and boarded in, forms its cellar. The diagram on the next page gives a sectional view of the river, its banks and the saw-dust deposit, with a house thereon. No available water supply is known to the writer, except the river. What the sanitary condition of these eight houses will be in the near future can be better imagined than described. I do not expect our municipal council will take any action in the matter; body and bones, they belong to the lumber company that is building the houses. Can you suggest any course that would prevent future sickness and death from the above cause? You can use this letter in any way you think proper.

I remain, dear sir,

Yours sincerely,

Thos. S. Walton, M.D.

To Dr. Walton's letter the following reply, by the Secretary of the Board, was made:—

Office Provincial Board of Health.

Toronto, August 6th, 1883.

Dear Sir,—Your very interesting letter was received some days ago, and in answer I would say that the subject is one which, as you have observed, is within the jurisdiction of the municipal council; but in case they are derelict in their duty, the private individual, with health affected by the saw-dust, has some power by way of indicting the mill-owner for keeping a nuisance. The matter, however, is one which, it would appear, will require more extended action, and this can and ought to be taken by the Fishery Inspector of the District, who is a Dominion official and has special power to prosecute

offenders who deposit saw-dust, slabs, etc., in the courses of streams and rivers. I understand that a Mr. Graham is Inspector for the District, and, if so, I should advise that he be called upon to act in the matter.

Trusting that I may again hear more from you regarding this important subject,

I remain your obedient servant,

PETER BRYCE, *Secretary.*

Thos. S. Walton, M.D., Parry Sound.

P. S.—Re similar subject see p. 56. annual report of the Board.

Dr. Walton again wrote:—

PARRY SOUND, August 10th, 1883.

Peter H. Bryce, Esq., M.D.,
Secretary Provincial Board of Health, Toronto.

Dear Sir,—Yours of the 6th inst., in reply to mine of 30th ult., relative to houses in course of construction on a deposit of saw-dust, duly came to hand. I feel so certain that our municipal council will refrain from acting, that I don't think it will be discreet for me or any resident to approach them on that subject. As to bringing the matter under the notice of Mr. Graham, I judge that little good would accrue, seeing that the saw-dust is not deposited *in the stream* (that was stopped just before the deposit began), but *on the banks* of the stream. Proof that the deposit is a nuisance dangerous to health cannot be adduced, except at the cost of two or three lives, and as all the inhabitants of the houses are likely to be the employees of the mill-owner, an action by them is not probable, consequently we shall, I suppose, have to ignore, in this case, the old maxim that "prevention is better than cure." Comprehensive and effective legislation in "*saw-dust matters*" is needed.

I remain, dear sir,
Yours sincerely,
THOS. S. WALTON, M.D.

The Secretary, believing it would be desirable to secure as a regular correspondent a gentleman who has shown himself so public-spirited, in the matter of sanitary reforms, as has Dr. Walton, wrote him as follows:—

TORONTO, August 25th, 1883.

My Dear Sir,—It has given me pleasure to observe the interest that has been shown by you in public health matters, and I write asking you to do the Board the favour of extending that interest by becoming a reporter of weekly diseases to it as one for the Muskoka and Parry Sound District, which has so few medical men in it, for although it is proportionately well represented, yet the wide distances between them make it desirable that one or two more be added to our present list. I send you a copy of forms; and the directions for sending reports will be found on page 109 of the annual report which you have received.

Trusting to hear from you by filled up forms,

I have the honour to be,
Yours faithfully,

T. S. Walton, Esq., M.D. PETER H. BRYCE.

P. S.—As you are aware the law, as at present constituted, requires the local authorities to take first action in the matter of the saw-dust nuisance.

Dr. Walton's name will be found amongst the correspondents of the Board furnishing weekly reports of disease.

Article VII.

CORRESPONDENCE REGARDING THE REMOVAL OF UNSANITARY CONDITIONS IN MARKHAM VILLAGE AND THE FORMATION OF A LOCAL BOARD OF HEALTH.

The Secretary of the Board received from Dr. W. Robinson, of Markham, a letter which, like one received from Clinton (Article VIII.), so well illustrates the condition of the smaller towns and villages, that it is deemed desirable to insert it in full in this Report:—

Markham, June 28, 1883.

My Dear Doctor,—At the last meeting of Village Council I gave notice that I would introduce a by-law providing for the establishment of a Board of Health and the appointment of a Local Health Officer. As I am somewhat at sea you will kindly reply to following queries. My reason for acting in the matter is that nearly half of the villagers suffer from ague of a persistent type every summer; and as we have two slaughter-houses in the most densely populated portions of our village, the odours emanating therefrom are most sickening at present; and again privy vaults are never cleaned, and in almost any backyard you can easily detect this fact from their offensiveness. If you could send me a copy of a by-law answering the purpose, or send me the address of some town clerk having one in force, you will confer a favour.

1. Have we power to have slaughter-houses removed?
2. To order removal of night soil?
3. To enforce removal of manure from stables?
4. To have low-lying lands drained and mill ponds cleared of refuse and decaying organic matter?

By answering the above you will oblige

Yours, &c.,

W. Robinson.

Dr. Bryce, Secretary Board of Health.

In response to Dr. Robinson's request the Secretary sent the following answers:—

Office Provincial Board of Health,
Toronto, June 29th, 1883.

Dear Sir,—In answer to your letter, I would direct your attention to the Digest of the Health laws, found on page 94, Annual Report, as also to page 1 (*et seq.*) of the last Health Act. In those places, especially page 74, you will find answers to questions 1, 2, and 3 of your letter.

Regarding question 4 with respect to low-lying land, I think by-laws regulating them might be passed under No. 406, page 74; while on page 91 you will notice reference to drainage powers.

These are the principal points requiring attention With regard to a model set of by-laws, I am happy to be able to inform you that the Board has a pamphlet in press which will be complete in a few days, giving ample directions on the methods of procedure which it recommends to municipalities for adoption. I shall forward it with a recently published pamphlet and circular in a few days.

Trusting that you will apply to me in any other matter of difficulty,

I have the honour to be
Yours faithfully,

Dr. W. Robinson, Markham.

Peter H. Bryce.

From the additional correspondence found below it will appear that the energetic action taken by Dr. Robinson ended in having a Local Board and a Sanitary Inspector appointed for Markham, and that it had undertaken active operations.

MARKHAM, August 17th, 1883.

Dr. Bryce.

Dear Sir,—We have formed a Board of Health for this Municipality, and have inspected the entire population. There are some points I would, as the Inspector, like to know. What are the best tests for well water? I have several pumps that contain what I think impure water. I would like also to have a copy of all the pamphlets recently issued by the Society in Toronto. We have no drainage in the town, you must know. How far should closets be from dwelling house? Any other information bearing upon our sanitary work here will oblige. You are aware our by-law gives us power in many ways, and is a guidance in our making the village what it ought to be—thoroughly clean. We have had a few cases of typhoid fever and a considerable amount of ague, but upon the whole the neighbourhood is healthy,

Believe me,

Yours very truly,

REV. R. BULMAN, *Sanitary Inspector.*

TORONTO, August 18th, 1883.

In answer to your note I take pleasure in sending to you a copy of the Annual Report, and the principal publications of this Board. Regarding the question of how to test well-water, I am sorry to state that it would not be wise in me to recommend any test, since water analysis is a matter which is not learned in a day, and there would be danger of bringing disrespect upon all analysis by having it imperfectly done. In this respect the rules in the by-laws forwarded to you will be the best guide. If privies or manure heaps, or other filth are too near to wells, have them removed, and so prevent the possibility of contamination.

I shall be happy to hear from you, from time to time, as to the progress of your work, and of its results.

I have the honour to be

Yours very truly,

PETER H. BRYCE, *Secretary.*

R. Bulman, Esq., Sanitary Inspector, Markham.

The answers returned by the Municipal Clerk to the questions of Circular No. 10, sent out by this Board, which may be found in Appendix C, give additional force to the remarks made by Dr. W. Robinson in his letter.

ARTICLE VIII.

CORRESPONDENCE RE GOVERNMENT SANITARY INSPECTOR.

CLINTON, 2nd November, 1883.

Dear Sir,—Can you inform me if there is a Government Inspector whose duty it is to visit any town or village requiring health inspection, and also drainage and the disposal of sewage, etc. If so, what are the steps to be taken in order to secure his services?

Having been long connected with municipal affairs, both as Mayor and Councillor, I am convinced that the health inspection of small towns and villages where no system of drainage has been carried out by the municipality, amounts to nothing. With an excellent by-law as to health inspection and a corporation committee duly appointed,

this town is still as badly off as if there was nothing of the kind. One year, owing to the want of co-operation on the part of the proper parties, I had personally to seek the intervention of the Court of Chancery, and obtained a perpetual injunction against my neighbours for the prevention of nuisance.

Let me give you an idea of many small towns: Most people build their water-closets in the garden, and as the hole fills up, dig a fresh one and remove the building. These holes are frequently built near the wells, or in such a way that they are drained into street water courses, to dry up and create a stench in the summer. I know of one party who throws his sewage at the back door into a box, whence it runs 25 feet into a cess-pool 6 x 8 feet square and 6 feet deep, covered with a few boards, which has not been emptied for years. On this same place there is an old well, 12 feet deep, filled with closet manure, and the water putrifying, a piggery partly filled, two closets, a stable, 40 x 80 feet, all on a lot less than a quarter of an acre.

I could give you more instances, if necessary, to show the utter failure of municipal inspection. It has become the fashion to drain cellars and run sewage into the public drains on the streets alongside of foot-paths. Too often on municipal health committees there are men, such as tanners, etc., too much interested to do their duty. Until the Government appoints an Inspector and imposes heavy penalties for non-compliance with laws against nuisances, etc., the whole thing is imperfect. This Government Inspector should visit all parts of the province, and with full powers deal with all questions of health, drainage and sewage.

Please let me have a reply to my question, but do not make a public use of my name.

——— ———

P. H. Bryce, M.D., Secretary Board of Health.

APPENDIX F.

ARTICLE I.

REPORT OF SPECIAL COMMITTEE REGARDING A TEXT BOOK ON HYGIENE FOR SCHOOLS.

TORONTO, May 9th, 1883.

To the Chairman and Members of the Provincial Board of Health:

Gentlemen,—At the third regular meeting of this Board a motion was carried instructing your Committee to wait upon the Minister of Education and ascertain his views on the desirability of having instruction in hygiene regularly imparted in schools, and of having some systematic action taken on the part of this Board for the preparation of a suitable work on the subject. We conferred with the Hon. Mr. Crooks at our earliest convenience and have much pleasure in giving you a *resumé* of the views he expressed during our interview. He laid great stress on the general principle that a good system of education should be made as elastic as possible. And while recognizing the fact that certain subjects of study, viz., arithmetic, spelling, etc., should be compulsory, he expressed an opinion in favour of allowing teachers and trustees to select such other optional subjects of study as might, in their judgment, seem best suited to their several requirements. He expressed an opinion in favour of having hygiene taught in the schools. Also that suitable books should be placed in the hands of pupils and teachers, so as to enable them to become properly acquainted with the subject. This, in his opinion, would necessitate at least two different text books on hygiene, viz., one elementary in character for the pupils of the third and fourth classes of the Public Schools, and the other a more elaborate work for advanced pupils and teachers. He also stated that such a work as the one last referred to had been for some time used as a text book in the Normal School.

In reply to a question as to whether any particular text books on hygiene, were recognized by the Education Department, he stated that no particular work was recognized, but that, in order to afford us every opportunity of obtaining information on the subject, he would forward to the Secretary of this Board all the books on hygiene and physiology authorized by his Department. The books here referred to were received in due time by your Committee. They were carefully studied and compared; but while fully appreciating their many excellencies we do not feel justified in saying that any one of them fully meets all the requirements of the case. The general conclusions by your Committee are:

1. That under present circumstances it would not be desirable for this Board to assume the responsibility of taking any systematic action in the preparation of a suitable work or works on school hygiene.

2. That greater prominence should be given in public and high schools to the study of hygiene, even though it would necessitate a diminished attention to or the exclusion of some other subject now on the programme.

3. That to accomplish this end in the most satisfactory and expeditious way physiology and hygiene should be made a compulsory subject for the fourth class in public schools, and for intermediate examinations.

If not made compulsory it should, at least, be recommended by the Department as a most desirable subject of instruction in public and high schools.

4. In case hygiene were made a compulsory subject, as we have indicated above, we think a demand would soon be created which would encourage the production of a treatise on hygiene, suitable for use in the schools of Ontario.

As an illustration of the effect of increasing the number of pupils studying a particular branch by making it compulsory, and the contrary effect of decreasing the number by making it merely optional, we may quote some statistics from the reports of the Minister of Education, Ontario. Since 1877 hygiene has been a compulsory subject in the professional examination for teachers. Indirectly this has had the effect of increasing the number of pupils studying it in the Public Schools as shown by the statistics. There were engaged in the study of hygiene in the Public Schools

In 1879	27,846
" 1880	30,002
" 1881	33,641

—a steady increase. Whereas in High Schools, where hygiene is an optional subject, the number of pupils engaged in the study of this branch was

In 1879	238
" 1880	131
" 1881	71

—a steady decrease.

In drawing this report to a close we wish to emphasize an opinion which has already received a wide and well-merited currency in the medical press, viz.: That hygiene should be taught in public schools because the susceptible minds of the young are particularly adapted to receive and retain such instruction, which will afterwards be spread broadcast among the masses, thus preparing the way for the enforcement of sanitary laws.

All of which is respectfully submitted.

John J. Cassidy, M.D.
H. P. Yeomans, M.D. } *Committee.*

Article II.

REPORT OF COMMITTEE ON SCHOOL HYGIENE.

To the Chairman and Members of the Provincial Board of Health:

Gentlemen,—As you are aware, the paper on "Medical Inspection of Schools," read at the last meeting of this Board by Dr. Covernton, led to the adoption of a resolution:

"That a series of questions be addressed to school authorities throughout the Province with the view of obtaining information regarding the sanitary condition and requirements of school buildings."

These questions have been prepared in circular form for distribution in accordance with this resolution.

In the work of sanitary reform now going on in this Province school hygiene occupies a prominent place.

According to the Report of the Minister of Education there are in Ontario about 480,000 pupils and over 7,000 teachers; and we spend annually in the work of education in our public schools upwards of three and one-quarter millions of dollars.

The health of thousands of teachers and hundreds of thousands of children, all occupying a most important position in relation to the best interests and future prosperity of the Province, is certainly worth our attention; and the expenditure of such a large sum of money demands careful supervision.

It has already been observed and demonstrated that during school life a large part of existing disease and deformity is acquired; that the efficiency of teachers is greatly lessened, and that the physical and mental development of pupils is retarded through the

neglect of school hygiene. We should, therefore, exercise careful supervision of the health of children as they enter our public schools and pass onward through high schools and colleges to the active duties of life. We can also, under our admirable system of education, directly and quickly instruct the rising generation in sanitary science. The immediate effect of this instruction is to promote the health of the youth and to influence public opinion through our schools, and the ultimate effect will be to render the enforcement of sanitary legislation an easy task by educating the mass of the people in the great benefits resulting from an intelligent obedience to the laws of health.

And again, there are social causes of disease which no legislation can reach because we cannot encroach upon the private rights of citizenship and invade the sacred hearths of homes in this land of freedom and liberty, in order to eradicate the many causes of disease to be found in the social and personal habits of individuals. These social causes of suffering and death must be driven out by the advancing intelligence of a people educated in the principles and laws of sanitary science.

The very high rate of mortality registered for phthisis (consumption) in this Province suggests most forcibly the necessity of enquiring to what extent improperly ventilated school-rooms operate as a direct cause in producing this disease. This is one of the most important questions in connection with school hygiene at the present day.

We have already collected sufficient facts to prove that phthisis is by far the most fatal of diseases in this Province; that it gives rise to more suffering and more days of sickness than any other; that one-third of those who die of consumption in Ontario are reported between the ages of twenty and thirty, and that it is a disease of early life. And it is universally admitted that breathing impure air generates this disease, especially in those who are in the least degree pre-disposed to it—it is admitted also, that it is a preventable disease, and that it is contagious.

No doubt the custom of sleeping in small, improperly ventilated bedrooms, so common in this country, operates as an important factor in producing this disease. But this custom is the result of ignorance regarding the necessity and methods of ventilation: we can attribute this want of knowledge only to the lack of instruction in sanitary science in our schools.

It follows, therefore, that the great prevalence of phthisis is largely due to neglect of school hygiene.

We may refer to a report of an investigation lately made in the State of New York upon the sanitary condition of schools in that State.

Briefly to place the report before you in general terms, it was found that:

1. Only one in fifteen of the common schoolhouses was well fitted for protecting the health of the pupils, and even in that one often, a neglect of sufficient ventilation existed.
2. The ventilation in common schoolhouses was badly designed; when good, its excellence chiefly depended on open windows and special facilities for controlling them.
3. In numerous instances a disgusting and degrading neglect of sanitary cleanliness existed in and about the schoolhouses.
4. The supply of drinking water was not good.
5. The seats and desks were badly constructed.
6. In some cases there were only 51 cubic feet of air space allowed for each pupil; in others, 55, 70, 72, 75, 83, 85, 96, 100, 119 cubic feet.

In one case forty-five cubic feet of air space was allotted to each pupil. We might briefly refer to this schoolroom in order to illustrate a condition of affairs not unfrequently met with in schools. A personal investigation was made in this case. The room was twenty-seven by twenty-three, and the ceiling nine feet high. Before entering the house coughing was heard proceeding from the room. Within it were found packed more than 100 little creatures, about the age of five, heaped together, as it were. The attendance varied from 100 to 120. The stove was briskly at work, the windows were freely opened, throwing draughts upon every child's head. The teacher said that if this was not done they all had headaches. The greater part of the children had colds. The floor

was wet; this was explained "to be due to the practice of squeezing out their wet slate rags in order to lay the dust."

This illustrates a practice common in this country of crowding young children into a very small schoolroom where a sufficient supply of fresh pure air cannot be obtained without dangerous draughts.

We will not here refer to the many causes of myopia mentioned in this report.

I would like, however, to draw your attention to the fact that the minimum standard of air space mentioned by some authorities as sufficient for each pupil is 250 cubic feet.

It becomes us to consider the advisability of admitting so low a standard as one to be recommended for adoption in this Province. We are, no doubt, safe in affirming that in order to maintain the air of our schoolrooms at a proper standard of purity and render it fit for respiration, 1000 cubic feet of air space should be allowed to each pupil. This estimate is based on the following data:—

1. Air contains ·4 (CO_2) carbonic acid per 1000 volumes.

2. And if we adopt 1000 cubic feet as our air space, then each individual exhales ·6 carbonic acid every hour per 1000 volumes of air.

3. When three renewals of fresh air are effected every hour each individual will, by respiration, add ($\frac{1}{3}$ of ·6) or ·2 of carbonic acid to the ·4 commonly contained in the air.

4. Consequently the ratio of impurity will be represented by ·6 carbonic acid to 1000 volumes of air with three renewals each hour and there will be no perceptible draught.

But two questions here present themselves:—

1. What amount of carbonic acid shall be accepted as the standard of permissible impurity?

2. How many renewals of fresh air can be effected each hour without injurious draughts?

With regard to the first question, Dr. George Wilson records the result of numerous experiments which he had a share in conducting, and states the following general conclusions, which corroborate the experience of Parkes:—

"That when the carbonic acid does not exceed ·8 in 1000 volumes of air, no tangible injurious effects upon the health can be detected, but when it reaches 1 in 1000 volumes of air the cumulative effects of breathing impure air manifest themselves."

Admitting this principle, the air space allotted to each individual pupil might be reduced to 500 cubic feet with an efficient system of ventilation. The reason for this is clear. Because, if with three renewals of fresh air every hour ·2 carbonic acid is added as the respired impurity for one individual in 1000 cubic feet of air space, then ·4 of carbonic acid per 1000 will be added for the same individual in 500 cubic feet of air space under the same conditions.

With regard to the second question, if six renewals of fresh air can be effected each hour without injurious draughts, 500 cubic feet of air space may be sufficient for each pupil, since this will keep the standard at ·6 per 1000 volumes.

This can be accomplished by having inlets and outlets favourably placed and judiciously managed, in a properly constructed room, according to some authorities. But skilful management in ventilating and warming is necessary in order to avoid injurious results.

Consequently there is a possibility of confining pupils in an air space of 500 cubic feet under certain conditions without serious injury resulting from breathing impure air.

Let us further ask ourselves, may we adopt a lower standard than 500 cubic feet of air space for each pupil?

In connection with this question, the system pursued in some schools in the United States of frequently opening doors and windows during school hours, in order to admit a free supply of outside air is worth considering.

The school authorities direct that a brief intermission shall be given to the pupils at the end of each hour. During this intermission marching, gymnastics and other suitable exercises are practised by the scholars under the superintendence of the teachers. This plan has many advantages to recommend it. The physical exercises tend to promote the health of the pupils and also greatly conduce to their comfort.

The frequent exercises in pure air, with open windows, assist the pupils in throwing off the injurious effects of imperfect ventilation and confinement in seats.

Under such a system as this, energetically carried out, may it not be claimed that the perfect health of pupils can be maintained with a less air space than 500 cubic feet?

The question as to whether 250 cubic feet of air space is sufficient for each pupil in this country, where we have rigorous winters and often sudden extreme changes of temperature, is one to which I would invite your attention: Whether this practice of occupying a doubtful position in the important matter of school ventilation is a wise procedure or not.

The only excuse that can be offered is that of economy, and in view of the great issues at stake this reason is scarcely justifiable. Should we not be careful to err on the safe side and endeavour to supply abundance of fresh air?

Liberality and a generous policy in this direction certainly tends to cultivate a national, physical and mental vigour, an element of wealth and prosperity in any productive country.

I wish to lay before you a communication from Mr. Dickson, Principal of the Collegiate Institute, Hamilton, who takes a deep interest in school hygeine. He has kindly furnished me with the blank form used in making out health reports for the Hamilton schools. A perusal of this communication will enable you to understand the system now in operation. This plan was suggested by a few members of the Medical Society, who have heartily co-operated with the school authorities. The school board furnishes the blank forms.

Before this system was adopted the daily attendance has been known to diminish from fifty or sixty to fifteen or twenty, owing to the prevalence of contagious diseases.

Mr. Dickson reports that "since the adoption of this system our classes have been remarkably free from diseases of a contagious nature."

He also says, "I see no reason why this system of reporting contagious diseases to head teachers could not be carried out in all the schools in the Province." He attributes the working out of this system largely to the hearty co-operation of the Medical Health Officer, Dr. Ryall, and a few of the members of the Medical Society of the city.

I will not further trespass upon your time, although there are some other points that might be properly introduced in this report.

In view of the importance of the subject of school hygiene and of the great interest manifested in it by leading educationists at present, the members of the Board cannot but feel a certain responsibility in this part of their work.

We have cause for congratulation in the fact that inspectors, teachers and school authorities, as well as leading members of the medical profession, and all friends of education, have already volunteered to assist in advancing the interests of this important branch of sanitary reform now going on in this Province.

H. P. Yeomans.

After the discussion of the report, it was moved by Dr. Oldright, seconded by Dr. Rae, and carried: That the report be adopted, and that the Secretary be directed to transmit a copy of it to the Minister of Education; and that the Board responds to the questions submitted to them in the report as to the minimum of absolute air space to be provided for each child, by expressing the unanimous opinion of its members to be, that the minimum should in no case be less than 500 cubic feet; and that this small space should be permitted only where there are such efficient means of ventilation and heating as will change the contained air six times per hour, thus allowing 3,000 cubic feet of breathing air per hour to each child; and further, that such means as will change the air this number of times are the exception rather than the rule.

Article III.

COPY OF CIRCULAR ADDRESSED TO INSPECTORS AND TEACHERS.

Office of the Provincial Board of Health of Ontario,
27th November, 1883.

To the Teacher of ——————

Dear Sir or Madam,—In the interests of school hygiene and with a view of obtaining useful information regarding the sanitary condition and requirements of school buildings, the Provincial Board of Health solicits replies to the following questions from school authorities in the Province.

It is confidently expected that very valuable information will thus be collected, and therefore your assistance is respectfully invited in this important work.

Two copies of this circular are sent to each teacher, one to be handed to the Secretary-Treasurer, the other to be filled in by the teacher and returned with the Annual Report to the Inspector, who will forward it to the Secretary of the Provincial Board of Health. Postage on School Forms filled up and not sealed, one cent.

As it is desirable to obtain answers from all grades of schools, principals are hereby requested to hand a copy of this circular to each teacher in their respective schools.

I have the honour to be, your obedient servant,

P. H. Bryce, *Secretary.*

Questions.	Answers to Questions.
1. State the name of the school, the county and municipality in which it is, and the number of division if a graded school, or the number of the school section if in a rural district.	
2. Draw a rough outline of the school-house, indicating the points of the compass, and showing positions of doors, windows, desks, seats, etc.	
3. State the average attendance of scholars in each room, (*a*) in summer, (*b*) in winter.	
4. (*a*) Give the dimensions of each room occupied by scholars, (length, height, width), (*b*) and the area occupied by large articles of furniture, such as presses, teacher's desk, stoves, etc.; (*c*) and state how many pupils you can at preseut seat without crowding.	
5. (*a*) What is the highest average attendance you have had since January 1st, 1883? (*b*) How many square feet of floor-space does your school furnish for each pupil of such average? (*c*) How many cubic feet of air-space for each pupil?	
6. (*a*) What is the estimated supply of fresh air per hour in cubic feet for each pupil during school-hours? (*b*) Do you think it is admitted without perceptible draughts?	

Questions.	Answers to Questions.
7. (*a*) On what side or sides of each room are the windows (north, south, etc.)? (*b*) How many square inches of window-space are there to each square foot of floor-space? (*c*) Is light admitted in front of the pupils, at their left or right side, or from behind them? or is it admitted from two sides? (*d*) Is light well distributed? (*e*) How near to the ceiling and to the floor do the windows extend? (*f*) Are there any blinds on the windows? If so, of what kind?	
8. (*a*) By what means are the school-rooms heated? (*b*) Is a uniform and equable temperature of from 63° to 70° F. constantly maintained during school-hours? Is this tested? (*c*) Is the air dry? What means are adopted for supplying moisture?	
9. (*a*) Explain fully how each room is ventilated in cold and in warm weather, (whether by windows open at the top or bottom, by ventilating flues, or in what other way). (*b*) Are the ventilating flues rough or lined with tin or zinc? (*c*) Are the flues heated, or what means are used to create draughts in them? (*d*) What are the sizes of the flues? (*e*) How and where are the inlet and outlet flues respectively situated? (*f*) Have you ever tested the rate and direction of inlet and outlet currents? (*g*) From what source is the air taken which is introduced into the rooms? (*h*) Are the upper window-sashes hung on pulleys? (*i*) To what expedients do you resort to prevent draughts from open windows striking the pupils?	
10. (*a*) Is the air of the school-room completely changed by opening doors and windows at stated intervals during school-hours and at recess? (*b*) If air is thus changed during school-hours, what exercises do the children engage in during this time?	
11. (*a*) How often is the school-room swept per week? (*b*) When is it swept? (*c*) When is it dusted? (*d*) How often scrubbed? (*e*) How often white-washed?	
12. Do pupils frequently complain of headache, cold feet, or any symptoms indicating the existence of defects in ventilation or heating?	
13. (*a*) What is the duration of school-hours and recesses? (*b*) For how many hours are scholars confined in each school-room during school-hours without intermission? (*c*) How are scholars and teachers occupied during recess? (*d*) Are calisthenic exercises, gymnastics or school-drills practised, to what extent, and when?	

Questions.	Answers to Questions.
14. (*a*) What is the average daily percentage of pupils absent from school on account of sickness, and (*b*) what is the greatest number absent during any month from this cause? (*c*) At what periods are the greatest numbers absent? (*d*) What, if any, contagious diseases have affected any of your pupils this year? (*e*) How many were seized? (*f*) How many others were absent through fear of contracting such diseases?	
15. (*a*) What is the source of water supply? (*b*) Is the water pure, cold and abundant? (*c*) If from a well, what means have been adopted to prevent its receiving the soakage from surrounding grounds? (*d*) Where is it situated in relation to buildings and out-buildings in each case? Give distances. (*e*) Is drinking-water kept in the school-house? If so, where is it kept, and how is it protected from dust and other impurities? (*f*) If filters are used, how often are their contents changed?	
16. Describe (*a*) the character of the soil; (*b*) the natural or artificial drainage of the school-site.	
17. (*a*) Describe the structure of the school-house. (*b*) Are there cellars or other excavations beneath it? If so, what are their dimensions and condition? (*c*) Is there any means of ventilation between the floor and ground? (*d*) Give information regarding surrounding shrubberry, trees, fences, sheds, etc.; (*e*) also regarding play-grounds and play-sheds.	
18. (*a*) Describe water-closets, privies or earth-closets. (*b*) Are those for the different sexes in separate buildings? (*c*) Are they properly protected from observation and from inclemencies of weather? (*d*) State where they are located in relation to the school-house, wells, etc., and give distances. (*e*) What means are adopted to keep them clean? (*f*) Are the receptacle and the closet itself well ventilated? (*g*) Is any disinfectant used, and what? (*h*) If water-closets are used, are the traps and appliances efficient? (*i*) In the case of privy-pits, how are the vaults constructed, how often emptied, and by what means?	
19. State fully what established rules and precautions are enforced to prevent the introduction and spread of contagious diseases.	
20. Do you keep a record concerning the vaccination of each pupil?	
21. Has each scholar a separate hat hook, and what rules are enforced in hanging up clothes, hats, caps, etc., of pupils?	

Questions.	Answers lo Questions.
22. Have you any observations to make regarding the clothing of pupils? Protection against sitting with wet feet, etc.?	
22. (*a*) Please state the numbers of pupils of various ages in your school or grade. (*b*) What do you think the most suitable age to begin school life?	
24. (*a*) Has the teacher calculated the time which would probably be required for the home work of pupils of various ages? (*b*) Has he (or she) taken any means of ascertaining the time which *is* so occupied?	
25. (*a*) How many pupils are under your charge? (*b*) How many assistants, if any, have you?	
26. (*a*) Have fire-drills been conducted in connection with the school? If so, how often? (*b*) Do all doors open outwards? (*c*) Describe the position of stair-ways in relation to doors, and state their width.	
27. Please state the modes and extent of rewards and punishments in existence in your school.	
28. (*a* How many different sizes of desks are there in your room? (*b*) How far is the front of the seat from the vertical line of the nearest part of the desk? (*c*) State the height of seat and of desk of each different size? (*d*) Are the desks single or double? (*e*) How far are the scholars seated from each other?	
29. Are means taken by the school authorities to avoid those errors that injure the health of pupils, such as reading badly printed books, stooping over desks, excessive study at night, want of change and (out-door) exercise, injudicious exercise, etc.?	
30. Is any instruction given in Hygiene?	

....

Teacher.

Article IV.

MEDICAL INSPECTION OF SCHOOLS.

Mr. Chairman and Gentlemen,—There can be no question that a periodical Sanitary inspection of schools is, from numerous points of view, of the utmost importance as an additional argument for the appointment of a Medical Officer of Health by every Local Board, which, let us hope, before long will have been created in every municipality in the Province. A brief notice of the various subjects that should engage the attention of the Medical Health Officer may at this meeting of the Provincial Board be in order. The importance of the subject has been fully recognized by our energetic city Health Officer, Dr. Canniff, and the time he has devoted to the inspection, and suggestions made in some instances for changes, cannot fail to bear good fruit. Influenced by this example, it is much to be desired that Local Boards of Health should give due prominence to this duty of their Health Officer and that they should consider that one of the chief obligations of the Medical Inspector should consist in preventing children who have been suffering from infectious diseases from re-attending school before the infectious period has passed, in visiting the houses of children absent from school in consequence of illness, and the making strict enquires into the general condition of the respective families. Under existing arrangements the warnings sent to schools by Medical Officers of Health generally come too late to answer any practical purpose and it must further be considered that such officers, in the past members of school board, by no means obtain information of all infectious cases. The duties of the Medical Officer of Health should further consist in ascertaining and certifying that the children seeking admission have been properly vaccinated, and free from contagious skin diseases. Medical inspection of the school premises and of the children in attendance, carried out in such a way as to interfere as little as possible with the work of instruction. In the case of new erections, they should be consulted on the site,—not overshadowed by houses or trees—on ventilation, floor space, heating and lighting—the latter very important, as the very great prevalence of myopia in children in modern times is referred to the multilateral lighting. On the Continent, great exception is properly taken to pine floors, as they are quickly worn, the knots projecting, the wood around splintering, and becoming collectors of mud and dust. In a season of colds and influenza, the children cough and spit, the expectorations dry, and the infected dust spreads catarrh or it may be the germs of phthisis in the school-room. Flooring should, therefore, always be oak. Dr. Joel, of Lausanne, has remarked, that the colour of the walls is a matter of importance, and reports an irritating and unfavourable experience of white walls on the eyes of children, especially those of a lymphatic and scrofulous habit; recommends the walls to be painted in oil or calcomined of a light blue shade above, the sur-base of a darker shade of blue, the result proving excellent. The rows of hat pegs should not be placed one above another for hats or cloaks, but in single lines, and each peg ticketed with scholar's name, as these hat racks are the frequent source of parasitic affections, particularly of pediculi and Tinea capitis. School furniture, forms, desks and school books, should also occupy attention. If we consider as M. St. Georges remarks, that during the period of childhood and growth, counting forty weeks of school for each year, that the child passes 12960 hours on school forms without counting the time occupied at home in preparing the lessons. If then this school furniture is of an objectionable pattern, the child takes and retains vicious positions, the future perils of which are spinal deformity and school myopia. The print of the school books should be large, with sufficient white space between the lines. The latrines and urinals should be carefully inspected. Dr. Budd was the first to establish the fact of the arrival of one individual at a school or barrack to be the occasion of an epidemic, often widely spread; sometimes it may be a young person who has only a

trifling relaxation, a short and premonitory diarrhœa, he falls ill with fever and no longer appears at school, but he has had time to deposit the germs of typhoid, which quickly fructify. Dr. Budd reports three severe epidemics of typhoid fever at Bristol, brought into a school by convalescents who had only a slight remaining diarrhœa, and Dr. Joel, of Lausanne relates a formidable epidemic of diphtheria at the military school of Chaux de Fonds, which was referred by medical experts to the condition of the latrines. Children then who have suffered from typhoid, diphtheria, and dysenteries or even diarrhœas, should not too soon be re-admitted; and thorough measures of disinfection at home should always precede a return to school. In regard to school myopia, Dr. Joel reports of 1703 children in the schools of Lausanne, 101 suffering from it. Dividing by sex: In 754 boys, 42; in 949 girls, 59; in classes:

Superior classes,	326 pupils	25 Myopics	or 7.67%
International class	672 "	37 "	" 5.50%
Lower "	705 "	39 "	" 5.24%

In Germany, Cohn found that while in village schools there were only 1.4 per cent. myopic; in city schools of a corresponding age there were over 10 per cent. Erisman found that those scholars in the same schools, and under the same influences, who studied most were most affected with near-sightedness. It would then appear that on the amount of work at school and at home, in the evening, preparing for next day's lessons, depends in a great measure the prevalence of myopia, excluding, of course, hereditary tendency. Erisman states that the great period for the development of myopia, that is, for its beginning, is from the tenth to the fifteenth year, just at a time when the body, as a whole, is developing most rapidly. A statement by Erisman, of what a model school-room should be, is the following: Length should not exceed 12 metres. Varrentrap and others limit it to 9 or 10 metres; depth, not to exceed 7 metres. Floor space 70 square metres, about 754 square feet; height not less than 4 metres or 13 feet; if over 4½ metres it gives rise to an echo. Corners should be rounded to prevent the latter fault. The cubic space of such a room being from 280 to 315 c.m., and as each scholar requires 6 or 7 c. m. of space (210 to 245 cubic feet) the number of scholars may be from 40 to 48 in the room, supposing the air to be changed two or three times an hour. In intervals of work the windows should be opened wide; the light should be taken from the left side only. A room which cannot be sufficiently lighted from that side is unfit for a school-room. The light is all the better when the windows are closely grouped and not distributed along the wall. The window sill should slope inward and its higher edge should be 1.1 or 1.2 metres above the floor, a little over 40 inches. Rules for the care of the eyes in school children will be found in Dr. Lincoln's paper on school hygiene (Buck's hygiene and Public Health). In addition to the tendency of myopia from over study, the question arises whether the courses of education pursued in our schools are sufficiently discriminative of the ability of all to undergo without injury. Here the opinion of the Medical Inspector of schools is specially called for, to decide whether the long hours of school and the multiplicity of subjects during the formative period of the child's life are without ultimate injury, within reasonable power of endurance. We must remember that the brain at an early age attains a size out of proportion to other organs, and members of the body, and that therefore a large share of time should be given to out-door amusement, particularly for the highly sensitive and nervous; and most important of all for the recuperation of brain energy, at least nine hours' sleep. Dr. Tuke in his work on insanity and its prevention, says: "Too many hours daily study and the knowledge of an approaching examination when the system is developing and requiring an abundance of good air and exercise, easily accounts for pale and worn looks, frequent head aches, disturbed sleep, nightmare and nervous fears. A strong constitution may be sacrificed to supposed educational necessities. As an illustration of the great attention paid to school hygiene in France, I have translated from Societè de Medecine Publique, the form of medical inspection of schools in the department of the Seine:—

Medical Inspection of Schools, translated by C. W. C. Summary of opinions expressed on the 6th of September, 1882, sitting of the 4th section, on Hygiene of Children at Intercolonial Congress at Geneva, relative to inspection, from a sanitary point of view, of all public and private schools ; also a detail of the regulations concerning the duties of Medical Officers of Common, Model or Normal, and High Schools in Paris :

1. The State is imperatively called upon to order an official and complete hygienic inspection of the localities of all public and private schools in operation.

2. The Government should appoint 1st, a School Physician-in-chief, having a consultative and deliberative function with the Minister of Public Instruction ; 2nd, for each Province or Provincial school, a Physician having a seat in the council.

3. At the commencement of the hygienic reform of schools, the Provincial Medical Inspector shall proceed to the inspection of all the schools of his Province, and will rigorously close all rooms which are dark and insalubrious from any cause, unless sufficient changes can be and are promptly made.

4. Each school may from its surroundings and situation, exercise noxious influences on health, therefore each school should have its school medical examiner.

5. Every registered physician may be eligible for appointment to this duty by the school authorities.

6. The School Physician should have consultative and deliberative functions equally with the School Principal, who should be held responsible for the carrying out of the hygienic rules recommended.

7. If the School Principal resist the enforcement of these, the Local School Physician should address himself to the Provincial Medical Officer, in whom will rest the right of closing the school.

8. The School Physician should never be required to oversee more than a thousand scholars.

9. In the instance of new buildings, the school physician shall give his opinion on the site and plans of the building, and shall superintend its construction. His opinions relative to number, position and dimension of the windows must be regarded, as also to the methods of warming, ventilation, furnishing, and disposal of excreta.

10. The School Physician should measure all the pupils at the commencement of every six months, and place them at seats and desks conformable to the height of each.

11. He ought each year to determine the condition of refraction of eyes of all the pupils.

12. The School Physician should reduce the number of pupils in the classes where the light is imperfect. He ought also to change the desks and seats which occasion a vicious position or attitude to the pupil, also all school books that are badly printed.

13. The School Physician should have the right to be present at the lessons. He should inspect every class at least once a month during the time of teaching, and direct his attention particularly to the lighting, ventilation and warming of the rooms, also to the attitude of the pupils.

14. He should be consulted in the preparation of programmes of study.

15. Every contagious malady that a pupil is suffering from should be communicated to the School Physician. He should not grant permission to return to school, until he has satisfied himself that all danger of infection has disappeared, and that all the belongings of the pupil, such as books, copy-books and clothing, have been most thoroughly disinfected.

16. When one quarter of the pupils of a school are infected by a contagious disease, the School Physician should ordain the closure.

17. Every School Physician will note down in a Register, all interesting hygienic particulars of the school, and notably the changes observed of vision of pupils. These registers should be submitted every year to the Provincial Medical Superintendent.

18. The reports of Provincial School Physicians shall be sent to the Medical Officer in-chief, who will publish each year a general Report of the Hygiene of the schools of the country.

Regulations Concerning the Duties of Medical Inspectors of Schools, Primary and High, also of Asylums in the Department of the Seine, France.

Article I.—Every Inspecting Physician on entering on his duties must send a letter to the Mayor of the municipality, a letter mentioning his residence, situation of his office, and hours at which he is to be consulted on school matters. This information will be transmitted by the Mayor to all the school Principals, whose schools are included in the charge of the Inspecting Physician, and in case of change of office or residence, or of days and hours of consultation, notice must promptly be given to the Mayor, who will be charged to give the information to the school authorities concerned.

Article II.—A special register for each school and asylum shall be placed at the disposal of the Inspector for recording the results of each inspection. The name of the inspector to be inscribed, and days and hours of attendance. The register of medical inspection shall be constantly held at the disposal of the appointed school authorities, who shall make inspection of it at each of their visits.

Article III.—Every School and Asylum must receive twice a month a visit from the Medical Inspector. He shall in addition make supplementary visits whenever required by the Mayor.

Article IV.—On arriving at each establishment, the Medical Inspector will commence with an examination of other localities than class-rooms, such as vestibules, covered yards, outbuildings, play grounds, water closets, urinals, etc., etc. He must on these occasions be accompanied by the Head Master or Mistress to whom he is to address such observations and recommendations that the condition of these localities may suggest. He will then visit every class-room, after thoroughly informing himself of the hygienic conditions of these class-rooms from the point of view of lighting, warming, ventilation, nature of school furniture, etc. He will proceed to an examination of the children, particularly of those who present the appearance of feeble health, or of indisposition.

Article V.—At the end of his visit the Inspector will enter in the register the result of his observations. He will answer the different questions formulated in the register on the above mentioned subjects (Article 4). He will afterwards inscribe in the columns reserved for this purpose the names of the children in whom he has recognized sufficiently pronounced symptoms of indisposition to render their detention at home necessary. In indicating the nature of the indisposition, he must take care to make known whether it be of a contagious nature. Finally, he will make mention of the number of children absent from the school in consequence of illness at the time of his visit, indicating from the information furnished him by the master or mistress, the ailments which appeared to dominate among the absent children.

Article VI.—After each inspection, or at the latest, after a delay of twenty-four hours, the inspecting physician will address a report to the Mayor informing him of the sanitary condition of the establishments visited. Forms of printed papers indicating the different questions to which the Medical Inspector has to respond, will be furnished the Inspector.

Article VII.—The Mayors of cities will have prepared an abstract of the propopositions contained in the bulletins of the Medical Inspectors, and they will acquaint without delay, the central Government, of all those that appear to them as urgent. They will reserve for submission to a more minute examination, such as having no immediate necessity, but indicating a general character, or suggesting important alterations in the premises, before forwarding them to the executive authorities. In the case of an epidemic they may, if the Medical Inspector advises as urgent the closing of the school, authorize such closure, but giving immediate notice to the Inspector of Primary Instruction, and also to the Central Administrator.

Article VIII.—The children in whom the Medical Inspector during his visit has recognized symptoms of a contagious affection, shall be immediately sent home with a letter indicating the motive. In this letter the parents must be informed that the children will not be re-admitted until they have been examined by the medical official, and having obtained a certificate from him that their return will be unattended with danger.

ARTICLE IX.—There shall be furnished to each school master and mistress a list prepared by the Central Board of Health, of all the diseases that are contagious in their nature, and in this list will be indicated the first symptoms of these diseases. If in the interval of the visit of the Inspecting Physician a child is taken unwell either in the school or asylum, the master or mistress of the class will give immediate notice to the superintendent. After examination if the superintendent fancies he discovers any of the symptoms described in the list of contagious diseases, he will have the child sent home, giving, in a letter to the parents, his reasons for so doing, and instructing them to have the child taken to the residence of the Medical Inspector, and that only on certificate from him that the indisposition or symptoms have not been those of a contagious disease.

ARTICLE X.—The same certificate may be exacted from children whose absence has been occasioned neither by the master nor by the Medical Inspector, but have absented them-selves from school on account of indisposition. In these cases the master or mistress must enquire into the nature of the ailments that have occasioned the absence, and if it prove to be one on their lists of contagious diseases, the parents must be informed that they cannot be readmitted until they have been examined by the Medical Inspector, and a certificate furnished by him. Notice of the residence of this officer, and of his hours of consultation being at the time furnished to them.

ARTICLE XI.—Every three months the Mayors of the arrondissements will address to the Prefect a report on the performance of the duties of the Medical Inspectors in their several arrondissements. They will indicate in this report the date of the visits made by the Medical Inspectors of all the schools in their district, and will indicate their opinion of the way in which these inspectors have severally performed their duties.

A copy of these rules shall be furnished to each Medical Inspector at the time of entering on his duties.

Respectfully submitted. CHAS. WM. COVERNTON.

ARTICLE V.

REPORT RECEIVED FROM G. DICKSON, M.A., HAMILTON COLLEGIATE INSTITUTE, *re* THE SANITARY ARRANGEMENTS AND HEALTH CONDITIONS OF THE HAMILTON SCHOOLS.

The following remarks from Mr. Dickson are accompanied by forms adopted by him in his monthly health reports, by forms of reporting cards supplied to the medical men of Hamilton, to be filled in by them, and by details concerning the seating capacity, ventilation, etc., of the city schools.

Mr. Dickson says :—" When children are allowed to attend school from houses where sickness of an infectious character exists, there is no doubt that the school has been an important factor in bringing about epidemics. The teacher cannot always detect the presence of infected pupils, and it is only when she sees her class growing less, or when she misses some familiar face that she inquires the cause, and learns, too late, perhaps, to take efficient preventive measures, that dangerous conditions were developing diseases among her pupils. On several occasions during the last few years whole divisions were affected with sickness, and before anything could be done to check the spread of the disease nearly all the class were under the doctor's treatment, and in some instances happy households were quickly transformed into dreary habitations. Not long ago a prominent merchant of this city addressed a letter to the newspapers in which he complained of the lack of proper means to prevent infection from being spread abroad, and he instanced a case that came under his own notice of a family desolated through the ravages of scarlet fever, leaving one member sightless and another deaf through its effects.

" Another family in the west end of the city was swept off by the same disease, and in this case the blame was traced to the carelessness of the attending physician in not reporting the cases to the school authorities; the children were allowed to attend school while a most malignant kind of scarlet fever existed in the house. For years the school

authorities seemed powerless to prevent the occurrence of sickness of an epidemic character, and although children were forbidden to attend school when any member of the family was ill with a contagious disease, yet there were some who seemed to be indifferent to the dangers to which they exposed others, and who sent their children regularly to school while diseases of a dangerous nature existed at home. In the winter and spring of 1877 whooping cough, measles, scarlet fever and chicken-pox were very prevalent in the city; the two first mentioned were in the west end, and the last two were the prevailing diseases in the schools of the east end of the city. In one week classes were known to run down from a daily attendance of fifty or sixty to fifteen or twenty. Impure air, the result of imperfect means for ventilating; the overcrowded state of the rooms; pupils bringing with them, imprisoned in their clothes, the atmosphere of their homes; the heat incident to the crowded condition of the rooms setting in motion any disease germs that may be present; and the developing systems of children, always susceptible to influences that militate against their healthy growth, are conditions favourable for the spread of contagious disease in school, and unfortunately, are present in nearly all schools—public as well as private.

"The plan at present employed by the school board was suggested by the members of the medical profession of the city. They agreed to co-operate with the board by reporting cases of contagious diseases that came under their notice, with the view of preventing pupils from attending school from houses where sickness existed during the time there was any danger of conveying the disease to others. The board furnishes the health officers and other medical men of the city, who are willing to co-operate with them, with blank forms to indicate the prevalence of contagious disease, giving the name of the family, street addresses, schools the children are attending, the disease and the name of the physician in charge of the case; these cards are sent to the principal inclosed in stamped envelopes, also furnished by the board, and the teachers are then informed of all cases belonging to their classes reported in this way, and none are allowed to return until competent authority certifies that the danger of conveying the disease is past.

"Now that all cases of sickness dangerous to public health are registered by the attending physician, there is little possibility of children so reported attending until the proper time has elapsed for them to return. There is a class, however, not reached by this means; they are those who employ no doctor. To reach these, and also to afford an additional safeguard, each teacher is required to make a monthly return of all children in her division who are absent through their own sickness, or that of any other member of the family, and also of all who are coming from houses where there is sickness of any kind; and in all cases the nature of the disease is given as far as can be ascertained. The teachers are instructed to report *all* cases of sickness, of whatever kind it may be. Last month it was found that measles and a mild kind of scarlet fever were prevalent in the city, but it has not assumed the character of an epidemic. Warning was given through these health reports, and at once the teachers were more vigilant in their endeavours to isolate all cases in their classes. In some cities and towns houses having cases of infectious diseases are placarded, or isolation of the disease is enforced by the removal of the sick to the hospitals. In too many cases contagious and other preventable diseases are allowed to gain a foothold before giving them battle. Five years ago several children in one of the principal schools were stricken down with scarlet fever, and it was thought by some that the sanitary condition of the school rooms was not what it should be—that the atmosphere in the class-room was favourable to the development of the disease, and although it was found out that the disease was given to others by a child returning to school too soon after recovery, yet to make sure, the school-rooms were fumigated by filling them with chlorine gas for two days. To effectually disinfect rooms, they must be rendered for the time irrespirable with some gas capable of destroying all germs. Disinfectants are too often merely deodorants. It may be stated generally that disinfectants are useful as adjuncts to other hygienic measures, but they cannot displace them, except to a small extent and in a very imperfect way.

These health reports show the disease prevalent in different parts of the city. Typhoid fever is more frequently reported from houses having sewer connection than from those draining into cesspools. The cause is not far to seek; the suction force of sewers syphons the traps and the gas has a free entrance to the house.

The caretakers are instructed to see that the school and its surroundings are kept in a cleanly condition as far as possible, that disinfectants and deodorizing materials are used in waterclosets, and that the air supply is not drawn from the basement, or from filthy cold air-ducts.

CARD TO INDICATE THE PREVALENCE OF CONTAGIOUS DISEASE.

[Used by Health Officer—sent to Principal of School.]

Name, ...
Residence, ...
School, ...
Disease, ...
Date, ...
Signature, ...*M.D.*

CARD TO INDICATE RECOVERY FROM CONTAGIOUS DISEASE.

[Form of certificate used by doctors.]

THIS IS TO CERTIFY *that* ....
of No ....*Street, has recovered from* ....*and may return to School without danger of carrying the disease, and that no case has occurred in the family within four weeks.*

Dated,..............................*18*....

[Signature,]..
M. D.

HEALTH REPORT FOR MONTH OF..........................188 .

No............*District:* ....*School;* ....*Teacher.*

Teachers will see that the entries in this Report are made during the month—not left to the last day of the month.

Pupils absent sick.		Pupils absent on account of sickness of others.		Pupils coming from houses where sickness exists.	
Name of Pupil.	Disease.	Name of Pupil.	Disease.	Name of Pupil.	Disease.
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
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16.					
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19.					
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21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					

Each teacher in the city schools (about 107 in all) is furnished with one of these sheets at the beginning of each month. If a pupil is absent through sickness the name is entered in the proper column on this sheet. At the close of the month these are summarized and reported by the Principal to the Board at its monthly meeting. A list of contagious cases, reported by the Medical Health Officer, Dr. J. Ryall, is kept by the Principal, who compares it with those given in this report. The teachers are notified on receipt of the doctor's card. Since this system has been adopted there has not been an epidemic amongst school children that interfered to any great extent with the school attendance.

SEATING CAPACITY, HEATING, ETC., OF THE SCHOOLS.

SCHOOL AND No. OF ROOMS.	Dimensions of Rooms.		Seats.			Attendance 2nd Session.		Method of Heating.				Light, Position of Windows.				Ventilation.
	Length and Breadth.	Floor space per sq. ft.	Maximum legal seats if properly ventilated.	Actual No. of seats.	Space to each seat minimum legal space 12 sq. ft.	No. on Roll.	Sq. ft. per Pupil.	Stoves, wood and coal.	Furnaces coal.	Furnaces wood.	Steam	Back of Pupils	Right of Pupils	Left of Pupils	Front of Pupils	—
Victoria School:																
Room No. 1	26x23	598	50	42	14.2	35	17.0	......	C.	......	......	2	2	......	......	Poor.
" 2	26-10x22-8	608	57	60	10.8	42	14.4	......	C.	......	......	1	......	2	......	One small rough flue less than a Square foot in size, extends from each room into one large main ventilator in the attic. The size of ventilator going through the roof is 2 sq. feet. The flues are on inside wall, but are not heated; consequently very little ventilation at any time.
" 3	24-3x19-6	473	39	52	9.0	73	6.4	......	C.	......	......	1	1	......	......	
" 4	24x19-10	476	40	58	8.2	54	8.8	......	C.	......	......	2	......	2	......	
" 5	24x17-11	430	36	64	6.7	59	7.2	......	C.	......	......	......	2	......	......	
" 6	26x22-9	591	49	60	9.8	68	8.6	......	C.	......	......	1	......	2	......	
" 7	29x24-3	703	58	60	11.6	56	12.5	......	C.	......	......	2	2	......	......	
" 8	23x25-11	596	50	64	9.3	64	9.3	......	C.	......	......	2	2	......	......	
" 9	28-9x24-3	697	56	64	10.8	60	11.6	......	C.	......	......	2	......	2	......	
" 10	26-1x22-3	580	48	60	9.6	41	14.1	......	C.	......	......	1	......	2	......	
" 11	28-11x24-10	718	59	69	11.9	44	16.3	......	C.	......	......	1	2	......	......	
" 12	28-10x24-4	701	59	64	10.9	38	18.5	......	C.	......	......	2	......	2	......	
" 13	26x23-5	609	50	64	9.5	44	13.8	......	C.	......	......	2	2	......	......	
Engine House:																
Room No. 1	18-9x20	375	31	48	7.8	53	7.0	1 C.	......	......	......	1	1	......	......	None.
" 2	17x22	374	31	54	6.9	149	2.5	1 C.	......	......	......	1	1	1	......	
Hunter St. School:																
Room No. 1	26-2x24-2	632	52	62	10.1	56	11.2	1 C.	......	......	......	2	......	1	......	Poor, merely an opening into the attic.
" 2	26x23-11	621	52	50	12.4	55	11.2	1 C.	......	......	......	2	1	......	......	
" 3	26-10x22-10	612	51	62	9.8	57	10.7	1 C.	......	......	......	2	1	......	......	
" 4	26-10x22-2	597	50	85	7.0	117	5.1	1 C.	......	......	......	2	......	1	......	
Wellington St. School:																
Room No. 1	26-1x24-3	632	53	58	10.8	67	9.4	1 W.	......	......	......	3	1	1	......	Same as that of last school.
" 2	25-10x20-3	626	52	63	9.9	64	9.3	1 W.	......	......	......	3	1	1	......	
" 3	24-6x17-4	424	35	56	7.5	67	6.3	1 W.	......	......	......	1	......	2	1	
" 4	24-2x17-3	416	35	64	6.6	118	3.5	1 W.	......	......	......	1	2	......	1	

Central School:																	
Room No. 1	26-3x22-7	519	49	68	7.6	42	12.3		C.			3		3		Poor.
" 2	26x32-7	847	70	56	15.1	36	23.5		C.					4		
" 3	26-5x12	317	26	55	5.5	63	5.0		C.					2		Wooden ventilating ducts
" 4	27x34-1	920	76	56	16.4	46	20.0			W.				4		on cold walls extend to the
" 5	20-4x27	549	47	40	13.7	41	13.3			W.		3	2			roof. The air in this school
" 6	25-10x33-2	871	73	66	13.1	26	33.5			W.		3	4	1		is changed by opening doors
" 7	27-2x20	543	45	46	11.8	40	30.5			W.				3		and windows.
" 8	35x12	423		Library.					C.				Library.			
" 9	27-1x20	541	45	52	10.4	42	12.8		C.				3			
" 10	26-4x35-3	916	77	53	17.2	53	27.7		C.			3	1	3		
" 11	30-10x27-7	904	70	80	11.3	53	17.0		C.			3		3		
" 12	33-4x17-2	572	48	52	11.0	45	12.7		C.				2			
" 13	33-4x22-7	752	63	68	11.0	39	19.2		C.					3		
" 14	33-4x26-11	897	75	42	21.3	49	18.3			W.				2		
" 15	27-6x15	412	34	50	8.2	50	8.2			W.		2	3			
" 16	27-9x19-8	545	45	52	10.4	46	11.8			W.			1			
" 17	34-6x26-5	911	76	64	14.2	46	20.6			W.		2	4	1		
" 18	26-2x15-7	407	34	52	7.8	38	10.7		C.				3			
" 19	34-8x14-1	485	41	50	9.7	V'c'nt			C.			2	1	1		
" 20	27-6x15-8	485	36	70	6.9	46	10.5		C.					3		
" 21	35-3x26-9	942	79	64	14.7	44	21.4		C.			3	1	3		
Sheds:																
Room No. 1	33x19-1	630	52	54	11.6	48	13.1	W.					2	2		None. Air changed by
" 2	23-7x19-1	450	37	50	9.0	67	6.7	W.					2	2		opening doors and windows.
" 3	33-4x19-1	636	53	54	11.6	40	15.9	W.					2	2		
" 4	22x19-1	420	35	45	9.3	53	7.9	W.					2	1		
Maple St. School:																
Room No. 1	25-10x23-10	617	51	68	9.0	45	13.7		C.			2	2			Fair. Rough ventilating
" 2	25-7x23-9	607	51	65	8.9	38	15.9		C.			2		2		ducts on inside walls change
" 3	25-10x23-11	617	51	68	9.0	47	13.1		C.			2	2			the air perhaps twice a day.
" 4	25-7x23-9	607	51	65	8.9	52	11.5		C.			2		2		
Main St. School:																
Room No. 1	26x22-10	603	51	72	8.3	39	15.4		C.			1		1		Poor.
" 2	26-8x23-1	615	51	72	8.5	45	13.6		C.			1	1			There is an opening in the
" 3	26-8x23-5	624	52	64	9.7	40	15.6		C.			1		1		ceiling into the attic.
" 4	26-5x23-9	627	52	72	8.7	63	9.9		C.			1	1			
Hess St. School:																
Room No. 1	31-6x23-8	745	62	48	15.5	33	22.5				S.	4		2		Good.
" 2	31-7x23-8	747	62	72	10.3	53	14.9				S.			3		(See below.)
" 3	31-8x23-8	749	62	72	10.3	86	8.7				S.	2		3		
" 4	31-7x23-10	752	63	48	15.5	49	15.3				S.	2		4		

SEATING CAPACITY, HEATING, &c., OF SCHOOLS.—*Continued.*

SCHOOL AND No. OF ROOM.	Dimensions of Rooms.		Seats.			Attendance 2nd Session.		Method of Heating.				Light, Position of Windows.				Ventilation.
	Length and Breadth.	Floor Space per sq. ft.	Maximum legal seats if properly ventilated.	Actual Seats.	Floor space for each seat, minimum legal space if prop. ventilated 12 sq. ft.	No. on Roll	Sq. ft. per Pupil	Stoves, wood and coal.	Furnaces, coal.	Furnaces, wood.	Steam	Back of Pupil.	Right of Pupil.	Left of Pupil.	Front of Pupil.	——
HESS ST. SCHOOL.—*Continued.*																(See below.)
" 5	31-10x24-2	769	64	50	15.3	52	14.7	.....	.....	.....	S.	4	....	2	....	
" 6	32-10x23-11	785	64	48	16.3	50	15.7	.....	.....	.....	S.	....	....	3	....	
" 7	31-11x24-2	771	64	64	12.	44	17.5	.....	.....	.....	S.	2	....	3	....	
" 8	32-1x24-1	772	64	64	12.	35	22.	.....	.....	.....	S.	2	....	4	....	
" 9	31-2x24-2	753	64	50	15.	39	19.3	.....	.....	.....	S.	4	....	2	....	
" 10	31-10x24-2	766	64	50	15.3	41	18.6	.....	.....	.....	S.	....	....	3	....	
" 11	31-10x24-1	767	64	48	15.9	44	17.4	.....	.....	.....	S.	2	....	3	....	
" 12	32-10x24-2	793	64	48	16.5	46	17.2	.....	.....	.....	S.	2	....	4	....	
PEARL ST. SCHOOL:																
Room No. 1	21-10x21-7	471	39	54	8.7	51	9.2	W.	.....	.....	.....	2	....	2	....	Poor. Same as that of Main St. School.
" 2	21-10x21-7	471	39	64	7.3	49	9.6	W.	.....	.....	.....	2	2	....	....	
" 3	21-10x17-6	382	32	60	6.3	51	7.6	W.	.....	.....	.....	2	1	....	....	
" 4	21-10x17-6	382	32	60	6.3	79	4.8	W.	.....	.....	.....	2	....	1	....	
MARKET ST. SCHOOL:																
Room No. 1	29-11x23-6	689	59	69	10.1	41	17.0	W.	.....	.....	.....	2	2	....	2	None. Air changed by opening windows and doors.
" 2	29-9x19-6	580	48	60	9.6	45	12.8	W.	.....	.....	.....	1	1	1	..	
" 3	23-11x16-8	395	33	58	6.8	71	5.5	W.	.....	.....	.....	....	2	....	....	
" 4	23-7x12-6	294	25	58	5.0	66	4.6	W.	.....	.....	.....	....	....	2	....	
CANNON ST. SCHOOL:																
Room No. 1	26x24	624	53	50	12.4	33	18.9	.....	C.	.....	.....	2	....	3	....	Very defective. One ventilating duct from each room on inside wall, less than one sq. ft. in area, connecting with a small main in the roof. The air in these rooms is changed chiefly by opening windows and doors.
" 2	26x24-3	630	53	50	12.6	42	14.7	.....	C.	.....	.....	....	3	....	....	
" 3	26x24-6	637	53	64	9.9	77	8.2	.....	C.	.....	.....	....	....	3	....	
" 4	26x24-6	637	53	71	8.9	114	5.5	.....	C.	.....	.....	2	3	....	....	
" 5	26-6x24-7	651	53	64	10.1	58	11.2	.....	C.	.....	.....	2	....	3	....	
" 6	26-6x24-7	651	58	64	10.1	52	12.5	.....	C.	.....	.....	....	3	....	....	
" 7	26-6x24-7	651	53	64	10.1	55	11.8	.....	C.	.....	.....	....	....	3	....	

" 8........	26-6x24-7	651	53	64	10.1	55	11.8	.....	C.	.....	.....	2	3	....	....	
" 9........	24x23	552	46	56	9.8	33	16.7	.....	C.	.....	.....	2	....	2	....	
" 10........	24x23	552	46	56	9.8	42	13.1	.....	C.	.....	.....	2	2	....	....	
" 11........	24x23	552	46	56	9.8	44	12.5	.....	C.	.....	.....	2	...	2	....	
" 12........	24x23	552	46	56	9.8	42	13.1	.....	C.	.....	.....	2	2	....	....	
Mary St. School:																
Room No. 1........	29-10x23-7	703	59	60	11.7	58	12.1	W.	.....	.....	.....	2	....	....	2	None.
" 2........	23-9x17-7	407	35	50	8.3	50	8.1	C.	.....	.....	.....	....	2	....	....	
" 3........	23-9x11-8	277	26	46	6.0	61	4.5	W.	.....	.....	.....	....	1	1	....	
" 4........	29-10x20	596	50	50	11.9	64	9.3	W.	.....	.....	.....	....	....	2	....	
Murray St. School:																
Room No. 1........	26x24-6	637	53	62	10.2	59	10.7	.....	.....	W.	.....	2	2	....	....	Air changed by opening windows and doors.
" 2........	26x24-6	637	43	62	10.2	99	6.4	.....	.....	W.	.....	2	....	2	....	
" 3........	26x20	520	53	60	8.6	63	8.2	.....	.....	W.	.....	2	2	....	....	
" 4........	26x20	520	43	56	9.2	50	10.4	.....	.....	W.	.....	2	....	2	....	
" 5........	26x24-6	637	53	64	9.9	55	11.5	.....	.....	W.	.....	2	....	2	....	
" 6........	26x20	520	43	52	10.	49	10.6	.....	.....	W.	.....	2	2	....	....	
" 7........	26x20	520	43	52	10.	36	14.4	.....	.....	W.	.....	2	....	2	....	
" 8........	26x24-6	637	53	74	8.6	32	19.8	.....	.....	W.	.....	2	2	....	....	
Hughson St. School:																
Room No. 1........	23-8x15-8	370	31	49	7.5	39	9.4	W.	.....	.....	.....	1	1	....	1	No means of ventilating except through windows and doors.
" 2........	23-4x14-5	336	28	63	5.3	81	4.1	W.	.....	.....	.....	1	....	....	1	
" 3........	25-1x24	351	29	48	7.3	78	4.5	W.	.....	.....	.....	1	....	1	....	
Collegiate Institute:																
Room No. 1........	29-8x20-2	592	50	36	16.4	.....	.....	W.	.....	.....	.....	3	....	1	....	No means of changing the air except by opening the windows and doors.
" 2........	29-8x20-2	592	50	40	17.3	.....	.....	W.	.....	.....	.....	3	2	....	....	
" 3........	30-3x21-4	645	54	48	13.4	.....	.....	.....	C.	.....	.....	2	....	3	....	
" 4........	33-6x29-1	645	81	64	10.0	.....	.....	.....	.....	W.	.....	2	1	2	....	
" 5........	33-5x29-3	974	81	56	17.3	.....	.....	.....	.....	W.	.....	2	2	1	....	
" 6........	30-3x21-4	971	54	48	20.2	.....	.....	.....	C.	.....	.....	2	3	....	....	
" 7........	46-4x29-2	1351	112	91	14.8	.....	.....	.....	.....	W.	.....	2	1	2	....	
" 8........	30-2x21-4	643	53	48	13.4	.....	.....	.....	C.	.....	.....	2	....	3	....	
" 9........	30-2x21-4	643	53	35	18.3	.....	.....	.....	C.	.....	.....	2	3	....	....	
" 10........	Library.		Library.		....	.....	.....	.....	C.	.....	.....	1	....	....	....	
" 11........	21-10x14-4	183	Chemistry.		....	.....	.....	W.	.....	.....	.....	....	1	....	1	
" 12........	21-10x14-4	183	Chemistry.		....	.....	.....	.....	.....	W.	.....	1	1	....	....	

MEANS OF HEATING AND VENTILATING THE HESS ST. SCHOOL.

The Hess Street School is heated by low-pressure steam—by what is called the Direct-Indirect Principle. The building is three stories and has four class-rooms in each story. The radiators used are the "Nason" pattern; two are placed in each room; cold air is admitted behind each radiator. There are two ventilating registers in each class room in the flues on the inside walls. The size of registers is 14x22 inches. The ventilating flues, which are lined with tin, are built in the inside walls; each flue is taken to the attic separately, they are then joined to two main ventilators going through the roof of the building. Steam coils are placed in main ventilators in the attic. The size of ventilators going through the roof is four feet square, making thirty-two feet in ducts going through roof. The water-closet and urinals are fitted in an extension to the back of the building; the closet rooms are ventilated into a flue built in the boiler smoke flue from boiler. The water-closet soil pipes are taken through the roof full size.

In this school the number of children absent sick during the months January, February and March, 1883, was 25 per cent. less than in any other school in the city. The pupils belong mostly to the working classes.

The following is the number of pupils absent sick in all the schools during the year, as reported by the teachers:

January	530	(three weeks)
February	650	
March	683	
April	642	
May	521	
June	354	
September	364	
October	511	
November	622	
December	360	(two weeks)

Fully 50 per cent. of these cases are described as "colds" and "headaches," the attendance for each month being about 5,000.

APPENDIX G.

ARTICLE I.

[Not intended to correspond with Chapter VII., Part I.]

CATALOGUE OF BOOKS IN THE LIBRARY, EXCHANGES, ETC.

An Act to amend the Public Health Act, 1848 (England).
" " the law relating to Public Health, 7th August, 1866.
Act, Public Health, 1875 (England).
An Act vesting powers in the Privy Council for the protection of the Public Health.
Ann Arbor, Michigan, The Physician and Surgeon.

Blyth, A. W., Foods: Composition and Analysis.
Birmingham, Health Report of, for years 1881–'82.
Bradford, Borough of, Report of, 1880.
Barkingside, Dr. Thorne's Report on Outbreaks of Scarlet Fever at Home for Girls, March 3rd, 1880.
Baltimore, Maryland, Medical Journal.
Battle Creek, Michigan, Good Health.

Chicago, Chicago Medical Review.
" The Western Medical Reporter.
" Chicago Medical Journal and Examiner.
" The National Scientific Journal.
" Sanitary News.
City Board of Health Reports—
Atlanta City Board of Health Report for year 1882.
Boston " " " for years 1881, '82, and '83.
Baltimore " " " " 1878, '79, '80, '81, and '82.
Brooklin " " " for year 1875.
Cheltenham Health Report.
Derby Annual Report, 1880.
Detroit City Board of Health Reports for the years 1882 and '83.
Dublin Health Report, 1882. 1882.
Gloucester, Health Reports, 1879, '80, '81.
Kansas City Board of Health Report for the year 1882.
New York City Board of Health Report for year 1882.
Newcastle-upon-Tyne, Report of Health, Sanitary Condition of, 1880.
Paddington Sanitary Report, for 1880.
Philadelphia, Water Department, Chief Engineer's Annual Report.
Portland City Board of Health for the year 1881.
Salford, Tenth and Twelfth (1880) Annual Health Reports of.
St. Mary's Parish, in the County of Surrey, Twenty-fourth Annual Report of 1880.
St. Matthew and Bethnal Green Vital Statistics and Sanitary Condition Report, during the year 1879-80.
Toledo City Board of Health Report for the year1881.
Wilmington, Del., Water Department, Chief Engineer's Annual Report.
Worcester Sewage Report, 1882.
Detroit, The Journal of Progressive Medicine.
" The Therapeutic Gazette.

Detroit, The Detroit Lancet.
" " Clinic.
Dansville, New York, The Laws of Life and Journal of Health.
" " The Lecturer.
Documents of State and City Boards of Health—
Michigan State Board of Health Documents (vide Appendices, First Annual Report, p. 58, *et seq.*)
New York, " " " " " " " p. 33, "
" City " " " " " " p. 32, "
Boston " " " " " " " p. 26, "
Dublin Health Report, 1882.
" Report on the State of the Public Health for July, September and December, 1881, and April, 1882.
" Report on the State of the Public Health and Sanitary Work performed during 1880.
Derby, Borough of, Annual Report, 1880.
Danzig, Les Travaux D'Assainissement De, etc., Par M. A. Durand-Claye.

Eaux et Immondices Les Systemes D'Evacuation Des, D'Une Ville.
Epidemics and Contagious Diseases, Papers concerning provisions regarding them.
Evian Ses Eaux Minerales, 1881.

Fox, C. B., Sanitary Examinations of Water, Air and Food.
Fowler, R., M.D., Speech before the Metropolitan Asylums District Board.
Fever, Enteric, Reports on Outbreaks of.

Glasgow, Census, 1881—as a basis for the Statistics.

Hygiene des Habitations, et des Villes, 1882.
Healthy Homes, R. Sproule, M.D.
Huddersfield, Borough of, Annual Report, 1880.

International Congrès Quatrième d'Hygiène de Geneve, 1882.

Jahresbericht uber die Verwaltung des Sanitatswesens.
Journal of the Society of Arts, 1875.

Kensington Monthly Health Reports for 1881.

Laws Requiring Medical Men to Report Deaths and Infectious Diseases, Dr. Wight.
Louisville, Kentucky, The Louisville Medical News.
Lewisburgh, Pennsylvania, Science and Health.
London, England, The Scientific Roll.
" City, Day Census Report of, 1881.
" " Report on some Chemical Analysis of the Water from the Surface Wells, by W. S. Saunders, M.D.
" " Report of the Commissioners of Sewers on the Results of the Electric Lighting, in 1881.
" By-laws for Slaughter-Houses, 1877.
" Regulations for Houses occupied by more than one family.
Locations and Administrations of Special and General Hospitals in which Contagious Diseases are Received, by Sir J. R. Cormack, M.D.
Lead Pipes Action of Water upon, by W. S. Saunders, M.D.
Local Government Board, Annual Reports of—

Sixth, 1876–77.	Ninth, 1879–80.
Seventh, 1877–78.	Tenth, 1880–81.
Eighth, 1878–79.	

General Order, Urban Sanitary Authorities.

Lois Sanitaires en Serbie.
Magnin on Bacteria.
Medical Inspector's Return, in 1 Volume.
Medical Inspector's Reports on General Sanitary Conditions of certain places.
Michigan State Medical Society Transactions for years 1880 and '81.
Middlesex and Hertfordshire Seventh Annual Report, 1880.
Miquel, M., Les Organismes Vivants de L'Atmosphere.
Model By-laws for the use of Sanitary Authorities, from No. 1 to 14 inclusive.

National Board of Health Report, 1879, '80 and '81.
" " Review of the Operations.
New York, The Sanitary Engineer.
" The Herald of Health.
" Druggists' Circular and Chemical Gazette.
" The Sanitarian.

Paris, France, Journal D'Hygiene.
Philadelphia, The Medical Bulletin.
" The College and Clinical Record.
" The Medical News.
" Medical Register.
Public Health Reports, new series, from No. 2 to 8 inclusive; and also Volume 10, with Appendix 11.
Public Health, Arrangement of Clauses, 1875.
" " Reports, No. 1, 1873.
" " Acts, 1848, 1866, 1875.
Police and Sanitary Regulations, Report from Select Committee on.
Port Sanitary authorities' Regulations with respect to Medical Officers of Health—General Order.
Pauper Sickness and Death Returns, Memoranda and Tables.
Playter, Work on Hygiene.
Provincial Board of Health, Ont., First Annual Report.

Report of the Chief Signal Officer United States for years 1879, '80, and '81.
Report of Progress, 1877, '78, and '79.
Richardson, B. W., Preventive Medicine, by.

State Board of Health Reports—
Connecticut State Board of Health Report for year 1880.
Iowa " " " for years 1881 and '83.
Illinois " " " for year 1878.
Kentucky " " " " 1882.
Michigan " " " for years 1873, '74, '75, '76, '78, '79, '80, '81, '82.
Missouri " " Act Establishing, 1883.
Maryland State Board of Health Report for year 1882.
Massachusetts " " " years 1872, '75, '79, '80, '81, '82, and '83.
New Hampshire " " for year 1883.
New Jersey " " " 1880.
New York, Manual for use of Local Boards of Health in State.
" State Board of Health Report for years 1881, '82.
North Carolina " " " " 1879, '80.
Rhode Island " " " " 1879, '80.
Wisconsin " " " " 1876, '77, '78, '79, '80, and '81.
St. John Ambulance Wheeled Litter, Description of.
Statistical Abstracts for the Decennium, 1869-'78.

St. Mary's Abbots, Kensington, Annual Report on the Health, Sanitary Conditions, etc., of 1880.
Stockholm Contribution à la Geographie Medicale, 1881.
Sutton-in-Ashfield, Urban Sanitary District, Dr. Parsons' Report on Outbreak of Diphtheria, June, 1882.
Smallpox and Epidemics, Memorandum on the Duties of Sanitary Authorities.
Sanitary Record.

Toronto, The Canada Lancet.
" Monthly Weather Review.
" The Canadian Journal of Medical Science.
" The Canadian Practitioner.

United States, Report of the Marine and Hospital service of the.
" Navy, Hygienic and Medical Reports by Medical Officers of the.
" Army and Navy Reports, Hygiene of the.

Washington, Monthly Weather Review.
" National Board of Health Bulletin, 1879, '80, '81.
" Walsh's Retrospect.
Westminster, England, The Vaccination Inquirer and Health Review.
Whitechapel, District Report on the Sanitary Condition of, 1881.
Water Analysis.

APPENDIX H.

Article I.

MINUTES OF MEETINGS OF THE BOARD.

Saturday, January 20th, 1883.

A special meeting having been called, the Board met at 2 p.m. The roll being called, the following members were found to be present :—

Wm. Oldright, M.A., M.D , *Chairman*, Toronto; C. W. Covernton, M.D., Toronto; J. J. Cassidy, M.D., Toronto; Prof. Galbraith, M.A., Toronto; Francis Rae, M.D., Oshawa.

The reading of the minutes of the previous meeting having on motion been deferred, the Board resolved itself into Committee of the Whole for the consideration of the Annual Report, as drawn up by the Secretary.

The discussion of the contents of the Report was proceeded with, along with a reconsideration of the Lambton Mills Report, and it being 6.30 p.m., the Committee rose and reported progress.

The Chairman having called a special meeting, at his residence on Monday evening, 22nd inst., at 8 o'clock, the meeting adjourned.

(Confirmed) Wm. Oldright,
Chairman.

Monday, January 22nd, 1883.

(Adjourned Special Meeting.)

The Board met at the residence of the Chairman at 8 p.m., there being present :—

Wm. Oldright, M.A., M.D., *Chairman*, Toronto; C. W. Covernton, M.D., Toronto; J. J. Cassidy, M.D., Toronto; Prof. Galbraith, M.A., Toronto; Francis Rae, M.D., Oshawa.

The Board resolved itself into Committee of the Whole to complete the consideration of the Annual Report.

After some hours the Committee rose, and reported the Report as amended, leaving certain portions to be revised by the Chairman, in accordance with instructions adopted in Committee.

On motion of Prof. Galbraith, seconded by Dr. Cassidy, the report of the Committee was adopted.

It was then moved by Dr. Covernton, seconded by Dr. Rae, that lists of the names of persons to whom it would be desirable to send copies of the Report be furnished by members of the Board to the Secretary, that such may be forwarded accordingly; that two dozen copies be, in addition, sent to each member of the Board; and that all copies, except those for the use of the Government and Legislature, be sent out "with the compliments of the Provincial Board of Health." The motion was carried.

The meeting then adjourned at 4.15 a.m.

(Confirmed) Wm. Oldright,
Chairman.

First Regular Meeting.

(First Session.)

May 9th, 1883.

The Chairman called the meeting to order, by requesting the Secretary to read the minutes of the last meetings. The roll having been first called, the following were the members present:—

Wm. Oldright, M.A., M.D., *Chairman;* C. W. Covernton, M.D.; J. J. Cassidy, M.D.; H. P. Yeomans, B.A., M.D.; Prof. Galbraith, M.A.

The minutes having been confirmed, various communications were considered. Of these the following were the most important:—

1. A verbal communication from Dr. Playter, urging the advisability of disseminating sanitary knowledge by means of the *Sanitary Journal.* A written communication was also received from him concerning the urgency for a pamphlet being published by the Board on the necessity of suppressing immoral and marital sexual excesses.

2. A letter was received concerning the necessity for precautions being urged upon the people of Leslie village, in Vaughan township, for preventing the spread of scarlatina, which has prevailed there recently.

3. A letter from Dr. Harding, St. John, N.B., expressing his sense of the value of sanitary work; and,

4. His appreciation of the documents issued by the Board.

Various other communications were mentioned by the Secretary as having been received, some of these being from Prince Arthur's Landing, by Dr. Clarke, sheriff, and Dr. Thomas Smellie, surgeon of the Canada Pacific Railway; from Dr. Kincaid, of Peterborough, *re* the outbreak of small-pox there; from Mr. Monk, offering his reports for the use of the Board; from Dr. Carney, of Windsor, stating his reasons for discontinuing disease reports; and from Dr. J. C. Taché, Deputy Minister of Agriculture, acknowledging the importance of the work the Board is engaged in, and offering his assistance toward furthering it.

The Secretary having been directed by the Board to answer such of these as remained unanswered, and the reading of the Chairman's Annual Address having been deferred until the next session of the meeting, Dr. Covernton read the report of the Committee on Epidemics.

After the report was read, it was moved by Dr. Oldright, seconded by Dr. Yeomans, and carried: That the report be received and adopted, and that it be printed in the Annual Report.

Dr. Cassidy then read the report of the special committee appointed to confer with the Minister of Education, regarding the advisability of having a text book on Hygiene introduced into the schools of the Province, and the propriety of this Board undertaking the preparation of such a work. The report having been read, and, on motion, received, the Board, on motion of Dr. Oldright, seconded by Dr. Covernton, went into Committee of the Whole to consider it clause by clause. After a lenghtened discussion, the Committee rose and reported progress. On motion of Dr. Cassidy, seconded by Dr. Yeomans, the report as amended was adopted.

Dr. Canniff, Health Officer of Toronto, being present, was invited by the Chairman to take part in the deliberations of the Board, and, on request, made some remarks concerning the desirability of having medical health officers everywhere appointed; and further remarked that he considered the public ought to be indebted for the work already done by the Board.

The Board adjourned at 6 p.m.

(Confirmed) Wm. Oldright,
Chairman.

(Second Session.)

MAY 10th, 1883.

The Chairman called the meeting to order at 10.30 a.m., when the following members were present:—

Dr. Oldright, *Chairman*; Dr. C. W. Covernton, Dr. J. J. Cassidy, Dr. H. P. Yeomans, Prof. J. Galbraith.

The reading of the minutes of the last meeting having been on motion deferred, and no communications having been received, the Chairman proceeded to read his Annual Address for the year 1883.

It was thereafter moved by Dr. Yeomans, seconded by Dr. Covernton, and carried: That the address be received, and that it be incorporated in the Annual Report.

Dr. Covernton then made some remarks upon the valuable aid rendered by the press in publishing sanitary information during the past year.

These remarks were followed by those of several other members of the Board, urging the desirability of having every care taken that the newspaper reports of meetings of the Board be correctly made.

Dr. Yeomans, thereafter, made some remarks upon the advisability of drafting rules for the guidance of Local Boards of Health. Action thereon was deferred till a subsequent session.

Dr. Canniff being present, and having been invited to take part in the discussions, spoke concerning the necessity for the isolation of contagious diseases, and for the removal of small-pox cases to the hospital therefor.

The meeting then adjourned till 3.30 p.m.

(Confirmed) WM. OLDRIGHT,
Chairman.

(Third Session.)

MAY 10th, 1883.

The Secretary called the meeting to order at 3.30 p.m., the following members being present:—

Dr. C. W. Covernton, Dr. J. J. Cassidy, Dr. H. P. Yeomans, Prof. Galbraith.

Dr. Yeomans having been appointed Chairman *pro tem*, the minutes were then read.

No communications having been received, the consideration of a circular to Municipal Clerks and others was taken up.

The Chairman, at this stage of the Session, took his seat.

It was then moved by Dr. Cassidy, seconded by Dr. Yeomans, and carried: That a circular be issued to Clerks of Municipalities, Health Officers, and Correspondents of the Board, containing a series of questions, with the request that answers be returned to them.

It was moved by Dr. Oldright, seconded by Dr. Covernton, and carried, that the Board go into Committee of the Whole to consider the draft circular prepared by the Secretary.

The Committee, having risen, reported progress.

Prof. Galbraith then read the partial report of the Committee on Sewerage, Drainage, and Water-supply. Its completion, and the consideration of it, were deferred till another session.

Dr. Covernton then moved and Prof. Galbraith seconded the following motion, which was carried:—That the report of the Special Committee on a Text-book of Hygiene for Schools be printed as amended, in the Annual Report.

The meeting, on motion, adjourned till to-morrow at 10.30 a.m.

(Confirmed) WM. OLDRIGHT,
Chairman.

(Fourth Session.)

MAY 11th, 1883.

The Chairman called the meeting to order at 10.30 a.m., the following members being present:—

Dr. W. Oldright, Dr. C. W. Covernton, Dr. Yeomans, Dr. Cassidy, Prof. Galbraith.

The minutes having been read, Dr. Oldright read the remainder of the report of the Committee on Sewerage, Drainage and Water-supply.

Dr. Rae took his seat during the reading of this report.

After the reading of the report, Dr. Oldright moved and Prof. Galbraith seconded the motion: That the Board go into Committee of the Whole for its consideration.

After discussion of the report in committee, the committee rose and reported.

Dr. Rae then moved and Dr. Cassidy seconded the following motion, which was carried:—That the report of the Committee on the Disposal of Sewage be adopted as amended, and that it be printed in pamphet form for distribution.

The question of drafting by-laws for the guidance of Municipal Councils and Local Boards having again been discussed, it was moved by Dr. Covernton, seconded by Prof. Galbraith, and carried: That Dr. Yeomans be appointed a committee to frame by-laws to be recommended to municipalities, for their guidance in the formation of Local Boards of Health.

(Confirmed) WM. OLDRIGHT,
Chairman.

(Fifth Session.)

MAY 11th, 1883.

The Chairman called the meeting to order at 3 p.m., with the following members present:—

Dr. Oldright, *Chairman*, Dr. Covernton, Dr. Cassidy, Dr. Rae, Prof. Galbraith.

The minutes of the previous meeting having been read, and no communications having been received, the Board, on motion of Dr. Oldright seconded by Dr. Covernton, proceeded to consider in Committee of the Whole, amendments to the By-laws of the Board.

After discussion of the various clauses, the committee rose and reported the By-laws as amended.

The following amendments were adopted, on motion of Dr. Rae, seconded by Dr. Cassidy:

Amendments to By-laws.

Amendment 1.—The following was added to Article I., section 2, viz.: "In either case he shall give," etc. (following the words "majority of the members"), also—"and no business other than that embodied in such notice shall be transacted at any special meeting" (to be inserted at the end of section 2).

Amendment 2.—The following was inserted as Article I., section 3: "That members desirous of introducing new business at Regular Meetings shall give ten days' notice thereof to the Secretary, who shall notify members of the Board of the same."

Amendment 3.—That "(*f*)" under "Committees" shall be called: "The Committee on School Hygiene," and "(*c*)": "Committee on Sewage, Drainage, and Water-supply."

Amendment 4.—That "(*i*)" be added under the heading "Committees," and be called: "Committee on Publication."

Amendment 5.—That section two read, "Standing Committees shall consist of one *or more* members."

Amendment 6.—That "Standing Committees shall be appointed at the May meeting of the Board," be called section (4), under "Committees."

Amendment 7.—That present section five be called section six, and that the following be inserted as section seven under "Committees;" "The Finance Committee shall report at each regular quarterly meeting."

Amendment 8.—That the following be read as section eight under "Committees:" "That it shall be the duty of the Standing Committee on Publication to authorize and superintend the issue of all reports, pamphlets, and other publications issued by the Board."

Amendment 9.—That No. 1 under "Order of Business," be struck out.

Amendment 10.—That No. 3 under "Order of Business" be the reading of the Chairman's annual address (at the first regular quarterly meeting).

Amendment 11.—That under the heading "Amendments," the following words be added to section one: "of the Board, previous notice thereof having been given in accordance with section 3, Art. 1."

It was then moved by Dr. Oldright, seconded by Dr. Cassidy, and carried: That the Board go into Committee of the Whole to strike Standing Committees.

After consideration the Committee rose and recommended the following as members of the various Committees:—

Members of Committees for 1883.

1. *Epidemics:* Dr. C. W. Covernton.
2. *Sewage, etc.:* Dr. Oldright and Prof. Galbraith.
3. *Foods, Drinks, etc.:* Dr. C. W. Covernton.
4. *Heating, Ventilation, etc.:* Dr. J. J. Cassidy.
5. *Poisons, etc.:* Dr. F. Rae.
6. *School Hygiene:* Dr. H. P. Yeomans.
7. *Legislation:* Dr. Yeomans.
8. *Finance:* Dr. Rae.
9. *Publication:* The Chairman, Prof. Galbraith, and Dr. Cassidy.

On motion of Dr. Cassidy, seconded by Dr. Rae, the report of the Committee of the Whole was adopted.

Dr. Covernton then moved, and Dr. Cassidy seconded, the following motion, which was adopted:—

"That the Secretary be requested to forward to the following Professors of Hygiene and other distinguished sanitary scientists, copies of the *Globe* and *Mail* containing a report of the address delivered by the Chairman at the first regular meeting of the Board for 1883." A list of the gentlemen referred to in the motion was handed to the Secretary.

The question of the next Sanitary Convention was then discussed, when it was moved by Dr. Oldright, seconded by Dr. Rae, and carried: That a Committee be appointed to visit Cobourg, and, if possible, make arrangements for a Sanitary Convention to be held there in the second week of October next, this Committee to consist of the mover and seconder, and the Secretary.

The Secretary then drew the attention of the Board to suggestions made by various correspondents concerning the reporting of diseases. This matter, as also the completion of the circular for obtaining sanitary statistics was referred to the Committee on Publication.

The Secretary having referred to a request made by Col. Otter, through Mr. Thomas McMinn, that the plates used in preparing the pamphlet for the Resuscitation of the Drowned be loaned for a similar purpose to the Queen's Own Rifles, it was moved by Dr. Cassidy, seconded by Prof. Galbraith, and carried: That the request be granted.

A motion for adjournment concluded the first regular quarterly meeting of the Board for 1883.

(Confirmed) Wm. Oldright,
Chairman.

First Special Meeting.

June 5th, 1883.

The Board met at 2 p.m., and were called to order by the Chairman, the following members being present :—

Dr. Oldright, *Chairman*, Dr. C. W. Covernton, Dr. J. J. Cassidy, Dr. Yeomans, Prof. Galbraith.

The reading of the minutes of the last meeting having on motion been deferred, the Board went into Committee of the Whole to consider the report of the Committee on Legislation. After a lengthened consideration of its clauses, the Board rose and reported progress. The completion of the report was referred to the Committee on Publication in conjunction with the Committee on Legislation.

The meeting then adjourned.

(Confirmed) Wm. Oldright,
Chairman.

Second Special Meeting.

July 14th, 1883.

The Board met at 3.30 p.m., at the call of the Chairman, the following members being present :—

Dr. Oldright, *Chairman*, Dr. Covernton, Dr. Cassidy.

The reading of the minutes of the last meeting having on motion been omitted, the Board discussed the desirability of an investigation into the sanitary questions arising out of the London floods of July 10th. On motion of Dr. Covernton, seconded by Dr. Cassidy, it was decided that the Secretary of the Board be appointed a Commission to proceed to London to investigate and report to the Board.

The Board then adjourned.

(Confirmed) Wm. Oldright,
Chairman.

Second Regular Meeting.

(First Session.)

August 14th, 1883.

The Board being called to order at 2 p.m., the following members were found present :—

Dr. W. Oldright, *Chairman*, Dr. C. W. Covernton, Dr. J. J. Cassidy, Dr. F. Rae, Dr. H. P. Yeomans, Prof. Galbraith.

The minutes of the three previous meetings were read and confirmed. Various verbal communications were made by the Chairman, after which the Secretary read a brief report of the work of the past quarter and presented various documents relating to the same.

The work was summarized under the following heads :—

1. Communications concerning legislation in existence or contemplated by School Boards in reference to contagious diseases arising out of scarlatina in Perth, diphtheria near Grimsby, diarrhœa amongst school children at Cannington, scarlatina at Vaughan, etc., etc.

2. Communications concerning epidemic diseases—as small-pox near Claremont, diphtheria at Dickinson's Landing, diphtheria at Easton's Corners, typhoid at Markham, Niagara Falls, etc.

3. Communications concerning nuisances—as fat-rendering establishments at Doncaster and near Leslieville ; also certain nuisances at Richmond Hill ; slaughter-houses at

Wales, etc.; fluid refuse from a cheese factory at Easton's Corners; sawdust deposits at Parry Sound; excretal pollution of stream at Thorndale; stagnant pools at Cannington, etc.

4. Communications regarding jurisdiction and duties of Local Boards of Health, from Morrisburg, Markham, Port Dalhousie, Parry Sound, etc.

5. A large amount of miscellaneous communications. These were severally mentioned, and the action taken thereon by the Secretary stated.

The Board adjourned at 6 p.m., on motion of Dr. Rae, seconded by Dr. Yeomans, till Wednesday at 10.30 a.m.

(Confirmed) WM. OLDRIGHT,
Chairman.

(Second Session.)

AUGUST 15th, 1883.

The Board met at 10.30 a.m., the following members being present:—

Dr. Oldright, *Chairman*, Dr. Covernton, D. Cassidy, Dr. Rae, Dr. Yeomans.

The minutes of the last meeting having been read, and no communications having been received, the Board proceeded to the reception of reports from Standing Committees.

Dr. Covernton read a Report on the Adulteration of Milk.

It was thereafter moved by Dr. Cassidy, seconded by Dr. Yeomans, and carried: That the report be received, adopted and printed in the next Annual Report.

Dr. Covernton afterwards read a translation of a paper on School Visitation read at the Geneva Health Congress, and Dr. Yeomans made a verbal report of the Committee on School Hygiene, and read therewith the rules and regulations of the Education Department regarding the construction of school buildings, etc.

It was thereafter moved by Dr. Oldright, seconded by Dr. Rae, and carried: That the papers read be referred to the Committee on School Hygiene.

It was then moved by Dr. Cassidy, seconded by Dr. Rae, and carried: That the verbal report of the Committee on School Hygiene be received and adopted, and that the committee be requested to report finally at the next meeting of the Board, with a view to making certain necessary representations to the Minister of Education.

It was further moved by Dr. Yeomans, seconded by Dr. Covernton, and carried: That the same committee be instructed to prepare a circular for the purpose of obtaining from the various schools in the Province information required for the use of the Committee in preparing the report alluded to in the last resolution.

The Board on motion then adjourned till 2.30 p.m.

(Confirmed) WM. OLDRIGHT,
Chairman.

(Third Session.)

AUGUST 15th, 1883.

The Board met at 3 p.m., all the members being found present.

The reading of the minutes having been deferred, the Board, on motion, resolved itself into Committee of the Whole for the consideration of the Cholera pamphlet.

The Committee, after a lengthened consideration of the pamphlet, rose and reported the report as amended. It was adopted as amended.

It was then moved by Dr. H. P. Yeomans, seconded by Dr. Covernton, and carried: That Dr. Rae, the Chairman, the Secretary, and the mover, be appointed a special committee to recommend such sanitary legislation as they deem necessary, and report at the next regular meeting of the Board.

The meeting then adjourned.

(Confirmed) WM. OLDRIGHT,
Chairman.

(Fourth Session.)

August 16th, 1883.

The Board met at 10.30 a.m., all the members being found present.

On motion, the Board resolved itself into Committee of the Whole to further discuss the Cholera pamphlet. After a prolonged discussion the Committee rose, reported progress, and asked leave to sit again.

The meeting then adjourned till 2.30 p.m.

(Confirmed) Wm. Oldright,
Chairman.

(Fifth Session.)

The Board met again at 2.30 p.m., all the members being present.

The reading of the minutes having been deferred, the Board, on motion, went into Committee of the Whole on the Cholera pamphlet. The discussion of it was finally completed, and the Committee rose and reported the Report as amended.

The Report, on motion, was adopted as amended.

The Board then adjourned till 10.30 a.m., August 17th.

(Confirmed) Wm. Oldright,
Chairman.

(Sixth Session.)

Friday, August 17th, 1883.

The Board met at 10.30 a.m., the following members being present:—

Dr. Oldright, *Chairman*, Dr. Covernton, Dr. Cassidy, Dr. Rae, Dr. Yeomans.

The reading of the minutes having been deferred and no communications having been received, Dr. Oldright made some remarks concerning the steps which have been taken by the Committee on Markets and Health to improve the sanitary condition of Toronto. He also referred to the question of the Disposal of Sewage, especially of liquid refuse, on the Toronto Island, as one that would shortly demand careful consideration, and briefly stated the principal points in connection with the subject.

It was then moved by Dr. Cassidy, seconded by Dr. Yeomans, and carried: That the Report of the Chairman on the disposal of sewage, and concerning the contemplated system of sewage disposal for Toronto and the Island, be referred to the Committee.

The following motion in this connection was also carried:—

The Board, having learned that "garbage," *i. e.* street scrapings and other offensive materials, are being removed from the city to the Island opposite, for the purpose of making soil, would earnestly recommend to the proper authorities, that previous to removal, these materials should be effectually deoderized and disinfected.

Information having been received from Dr. McInnes, Vittoria, Norfolk, concerning a recent fatal accident from a boiler explosion, the Secretary was, on motion, instructed to thank him for the interest manifested by him in the matter of preventing accidents from steam threshers.

A letter of Mr. Samuel Clarke, Strathroy, having been read, the Secretary was instructed to answer the letter, agreeing with the principles enunciated, but expressing the inability of the Board at present to carry out his plans.

A resolution expressing the deep regret of the Board at the news of the untimely death of the late C. E. Brough, Esq., City Engineer, Toronto, was moved by Dr. Cassidy, seconded by Dr. Covernton, and carried.

Dr. Cassidy having alluded to the smoke nuisance in Toronto, the Board, on motion of Dr. Cassidy, seconded by Dr. Rae, recommended to its Committee on Ventilation the consideration of some means by which the smoke nuisance, at present so much complained of in this city, could be removed or mitigated, and that the Committee be requested to report on the same at the next quarterly meeting.

A communication from Dr. Ezra Hunt, asking the Chairman to attend the meeting of the American Public Health Association at Detroit, was read, after which a motion by Dr. Rae, seconded by Dr. Yeomans, was carried, delegating the Chairman and Secretary to attend the meeting at Detroit on November 13th, and that the Secretary proceed to Lansing.

The Chairman then read a letter from F. N. Boxer, Esq., C.E., Montreal, regarding the meeting of the Canadian Sanitary Association at Kingston. The question of sending delegates to the meeting, as also proposals to have Sanitary Conventions at London, Kingston, and Ottawa, were discussed. Dr. Cassidy moved, seconded by Dr. Rae, That the Chairman of this Board and Dr. Yeomans be appointed to attend the first meeting of the Canadian Sanitary Association, to be held at Kingston in September next. Carried.

Dr. Rae then moved, seconded by Dr. Yeomans: That arrangements be made for holding a Sanitary Convention in the city of London, should the medical men and municipal authorities of that city deem it desirable and be willing to co-operate; and that Prof. Galbraith and Dr. Rae be a committee to make such arrangements and attend the convention, and also that the Chairman and the Secretary be associated with them, if the Convention be held about the time of their going to, or returning from, the meeting of the American Public Health Association. Carried.

It was then moved by Dr. Covernton, and seconded by Dr. Rae: That a Sanitary Convention be held during the next session of the House of Commons at Ottawa, and that the members of the Board attend. Carried.

A partial report of the Committee on Poisons and Chemicals was presented, and on motion was referred to the Committee on Publication.

The Committee on Publication presented its report, which was read and adopted.

The report of the Special Committee on the London Floods was received and adopted.

A communication from Dr. Yeomans relating to certain unsanitary conditions at Mount Forest, was referred to the Committee on Sewage, Drainage, and Water-supply.

On motion of Dr. Rae, seconded by Dr. Yeomans, the Secretary was commissioned to investigate the cause of the extensive prevalence of malaria in the country lying along the Grand River, and was authorized to employ such help as he may deem necessary.

It was then moved by Dr. Yeomans, and seconded by Dr. Rae: That the Board have an isolation hospital constructed according to the plan presented by Dr. Covernton; that this hospital be exhibited at the next Industrial Exhibition at Toronto; and also that sanitary apparatus be placed on exhibition within the hospital, and sanitary pamphlets be distributed, and that the Chairman, Drs. Covernton and Cassidy be a committee to attend to this matter. Carried.

Moved by Dr. Covernton, seconded by Dr. Rae: That this Board recommend the Government to have 10,000 copies of the next Annual Report printed for distribution. Carried.

This concluded the second regular meeting of the Board, and the Board adjourned to the call of the Chair.

(Confirmed) WM. OLDRIGHT,
Chairman.

Third Regular Meeting.

(First Session.)

Thursday, November 29th, 1883.

The Board met at 3 p.m., all the members with the exception of Prof. Galbraith being present.

The minutes of the previous meeting having been read and confirmed, the next order of business, the reception of communications, was taken up.

The Chairman made a number of verbal communications, and the Secretary presented his quarterly report of communications received and work done.

The reports of Standing Committees were then taken up, when Dr. Covernton presented a report referring to the probable relations of continued periods of dull, moist weather upon the consumption of bread and other articles of food.

The report, as read, was received and adopted, on motion of Dr. Rae, seconded by Dr. Cassidy.

Dr. Cassidy next presented a lengthy report on the "Smoke Nuisance" from the Committee on Ventilation.

The report, as read, was received, and after discussion it was adopted, on motion of Dr. Covernton, seconded by Dr. Yeomans, and ordered to be printed in the Annual Report.

The report of the Committee on School Hygiene was next presented and read, and on motion of Dr. Covernton, seconded by Dr. Cassidy, it was received and partially discussed. The further discussion having been postponed, it was thereafter moved by Dr. Cassidy, seconded by Dr. Covernton, and carried: That in view of the agitation which is taking place regarding the pollution of Ashbridge's Bay, Toronto, by liquid manure from the cow-byres, the Committee on the Disposal of Sewage be requested to report to the Board on that subject.

(Confirmed) Wm. Oldright,
Chairman.

(Second Session.)

Friday, November 30th, 1883.

The Board met at 3 p.m., all the members except Prof. Galbraith being present.

No communications having been received, the report of the Committee on Hygiene was taken up.

After discussion, it was moved by Dr. Oldright, seconded by Dr. Rae, and carried: That the report be adopted, and that the Secretary be directed to transmit a copy of it to the Minister of Education; and that the Board responds to the question submitted to them in the report as to the minimum of absolute air space to be provided for each child, by expressing the unanimous opinion of its members to be, that the minimum should in no case be less than 500 cubic feet; and that this small space should be permitted only where there are such efficient means of ventilation and heating as will change the contained air sixteen times per hour, thus allowing 3,000 cubic feet of breathing air per hour to each child; and further, that such means as will change the air this number of times are the exception rather than the rule.

A special report from the Committee on Sewage, etc., was read, regarding the reported nuisance at the cattle-byres, Toronto.

It was then moved by Dr. Yeomans, seconded by Dr. Rae, and carried: That the report, as read, be adopted.

An informal discussion *re* various matters coming up before the Committee on Finance thereafter took place, when the meeting adjourned till 10.30 a.m. Saturday.

(Confirmed) Wm. Oldright,
Chairman.

(Third Session.)

SATURDAY, DECEMBER 1st, 1883.

The Board met at 11 a.m., the following members being present:—

Dr. Oldright, *Chairman*, Dr. Rae, Dr. Cassidy, Dr. Covernton, Dr. Yeomans.

The minutes of the previous session having been read and confirmed, and no communications having been received, various items of new business were taken up and advanced.

Amongst these was the question of the next Sanitary Convention to be held at Ottawa. In connection with this, and the proposal to have a course of public lectures on health matters during the coming season in Toronto, the following motion was passed:—

Moved by Dr. Oldright, seconded by Dr. Rae, and carried: That Drs. Covernton, Cassidy, the Secretary, and mover, be a committee to make arrangements for holding a Sanitary Convention at Ottawa, and for arranging for a course of lectures on sanitary subjects in Toronto during the ensuing winter.

The question of appointing a committee to take some concerted action in connection with the meeting of the British Association in Montreal next year, was thereupon taken up and discussed, but the further discussion of it was postponed.

The report of the delegates to the Canadian Sanitary Association, which met at Kingston, was next read by Dr. Yeomans. The report was adopted, on motion of Dr. Rae, seconded by Dr. Cassidy, and was ordered to be printed in the Annual Report.

The Secretary thereafter gave an outlined synopsis of the material to be printed in the next Annual Report.

The Finance Committee presented a partial report, which was received and adopted, on motion of Dr. Rae, seconded by Dr. Cassidy.

The Board then adjourned, to meet at the call of the chair.

(Confirmed) WM. OLDRIGHT,
Chairman.

PART III.

Article I.

THE CHAIRMAN'S INAUGURAL ADDRESS, MAY, 1883.

To the Members of the Provincial Board of Health:

Gentlemen,—A special meeting of the Board having been held in January, I did not consider it necessary that we should meet again in the following month. You having concurred in this view, and signified your pleasure that the by-law requiring a meeting in February should be suspended, this becomes the first regular meeting for the year. It may, therefore, be expected that I shall make a few remarks introductory to a consideration of our present position and prospective work, and it will aid us in this consideration to take a brief retrospect of the past year—the first in the existence of this Board.

One of the first points to which I would refer is the gratifying reception we have met with on all hands. And first of all I must allude to the press. The expressions with which our work has been referred to in the editorial columns of the various journals of the Province, have manifested a generous appreciation and desire to assist us. The interest taken has not only been gratifying to us, but has been most helpful to the cause of public health and sanitary improvement. The frequency of paragraphs and editorial comments bearing upon sanitary subjects is of itself an indication that this interest of the press in sanitary science appears to be growing, a fact which augurs well for the future welfare of the people.

The members of this Board are aware of the deep interest in the investigations it has conducted, and in its other labours, which has been evinced by the members of the Government and of the Legislature by which it has been called into existence. And from the number of communications that have come under your notice, and from your daily observations, you cannot have failed to perceive the same interest increasingly showing itself, not only amongst our brethren of the medical profession—on whom we must count largely for advancing the cause—but also amongst the whole people of this Province.

Among the more prominent evidences of this on the part of the profession, I may point to the regularity with which the disease reports are sent in week after week, and on the part of other persons to the lectures and courses of lectures on sanitary subjects, which are being delivered under the auspices of literary and other societies by medical men and laymen.

Co-existent with, and partly as the result of this growing interest in sanitary matters, there is a great deal of well-founded uneasiness and dissatisfaction regarding some of the conditions under which we live; a feeling that much sickness and death might be averted by better sanitary conditions and regulations.

These two features of the present condition of affairs lead me to the belief, which I feel sure you will share with me, that it is now time for us to push for and advocate the adoption by the Legislature of the first clause of the recommendations made by us in our report on legislation during the last session of Parliament, viz.: "the appointment by the municipal council of every city, town, incorporated village, and township of a Local Board of Health," which in turn "shall appoint a health officer" for the municipality, or "for several adjoining municipalities, should it be necessary for the purpose of avoiding expense or for other reasons."

In advocating this measure we shall, of course, have the almost unanimous con-

currence of the members of the profession to which most of us belong. And we must, in addition, arrange for an active co-operation by them in obtaining its adoption.

The more thoughtful portion of the community recognizes the fact that sanitary science, like other sciences, embraces questions which require study, and which may or may not have been studied by all or any of the successful candidates for aldermanic honours, questions to which they may or may not have given even that amount of attention which is necessary for the practical application of them to the requirements of a community. Hence, it does not follow as a matter of course that, because a man is an alderman he is the proper person to attend to questions relating to the sanitary conditions of the people among whom he resides; indeed, it has been found, by experience, that amidst the many subjects which have to engage the attention of a board of aldermen (or municipal council) sanitary questions are very apt to be crowded out or imperfectly dealt with.

It is also becoming a pretty widely recognized fact that some properly qualified person should be appointed to advise as to proper sanitary conditions and regulations and to see to their being carried out and maintained.

We shall have the support then of this class of the community in the effort to establish Local Boards of Health, and I feel confident that we may count upon the hearty co-operation of the press.

One other subject which calls for a few general remarks and for a careful consideration on your part is the position of matters connected with the restriction and prevention of contagious and infectious diseases. Amongst the recommendations of the Board in regard to legislation are some which are intended to supplement, in this regard, the provisions of the Public Health Acts now in existence. Until we obtain the establishment of Local Boards of Health the machinery for properly carrying out even these latter is wanting in most of our municipalities.

But, what about those localities in which there are now Boards of Health? We find that even there the beneficient intentions of the Legislature are sadly neglected. Besides the selfishness and inertia which always clog reform, there are certain special reasons for this neglect. One is a misconception on the part of many people of the object of the clause in the Act requiring notification of infectious disease. Many suppose it to be for the removal in all cases of the infected person, instead of its being in the vast majority of instances for the purpose of securing a sufficient separation of the infected from those who would otherwise be likely to become so.

Another reason is to be found in the objection on the part of medical practitioners to the manner in which some health authorities have provided for the notification of cases of infectious disease: by an open post-card instead of by a sealed slip such as those used by the correspondents of this Board in the weekly reports of prevalent diseases. With a few another reason exists in false notions regarding the demands of professional confidence. The legal practitioner is most scrupulous in reference to this point; he regards as sacred any knowledge that he may possess regarding the actions of his client who has committed a homicide; but even he does not consider it any part of his duty to connive at the continuance of the careless acts of a client by which the lives of others are endangered. Neither is it any part of the duty of a medical practitioner to connive at the disregard of his patient as to whether he sends the seeds of death and disease amongst his neighbour's, or it may be his customer's children.

I am glad to hear from the energetic secretary of the Ontario Medical Association that it is his intention to read a paper on this subject at the next meeting of that body, and I will not, therefore, enter further into the details of it. I hope that a helpful and temperate discussion will not only follow the reading of his paper, but that the matter will be considered in the same way throughout the various localities of the Province. I have used the word "temperate," in view of the character of the discussion as conducted in Great Britain. I would be sorry that the same should occur here amongst those to whom suffering humanity owes so much; whose self-sacrificing exertions none know better than we do, and whose feelings we should be most careful to respect, even though they be in the minority. At the same time we must see to it that the slaughter of the

innocents does not continue through any neglect or inaction of ours. A letter bearing forcibly on this very point has just been received by me and will be submitted to you to-day.

Since the last regular meeting of the Board the Province has been threatened with a formidable epidemic of small-pox in one of its most remote portions—the northern shores of Lake Superior. Through the energetic action of Dr. John F. Clarke, formerly a member of the Provincial Parliament, and now sheriff of the district and Medical Health Officer of the municipality of Shuniah, and of Drs. Smellie and McCammon, medical officers of the Canada Pacific Railway Company, the disease was quickly stamped out. It can only serve as another evidence of the necessity for a rigid system of immigrant inspection with its conjoined precautionary measures, and as an evidence, also, of the beneficial results of prompt measures on the part of medical health officers.

With regard to the recommendations of the Board in respect to needed legislation, I would inform those members who do not reside in Toronto, that at an informal meeting of those of us who are in the city, and of the medical members of the Legislature, the more important clauses was discussed, and met with the approval of all present. It was found impracticable, however, to have them properly considered by the Legislative Assembly in the hurry of its closing session, and it was thought advisable to defer them until the meeting of the next Parliament, when, as already indicated, there is every reason to anticipate their adoption.

It is not my intention to discuss in this address all, or even a large number, of the subjects which will come before the Board during the ensuing year. These will, as during the past year, be found in the notice papers on which I, in common with other members of the Board, indicate those subjects and items of business which we desire to have taken up, and many of which have been incorporated by the Secretary into that chapter of our annual report entitled, "Work to be Done."

I will not, then, detain you with any further remarks, but conclude by thanking you for the kindly and courteous assistance you have given me in the discharge of my duties as Chairman during the past year.

Article II.

REPORT OF THE LONDON SANITARY CONVENTION.

[By the Secretary.]

The Board having determined to continue the method of disseminating sanitary information by means of sanitary conventions, accepted the invitation extended to it, through its Secretary, by a public meeting of the Health Committee and medical gentlemen of London, to hold a convention in that city. Arrangements having been made for holding such convention on Friday and Saturday, the 16th and 17th of November, the Chairman, Secretary, and Dr. F. Rae and Prof. J. Galbraith, members of the Board, proceeded to London, and were met by members of the active Local Committee, whose names will be found printed in the programme found in this Report.

Although on the morning of the 16th the first heavy snowstorm of the season had occurred, the forenoon session was well attended by influential citizens and members of the medical profession of London. The sessions, both on Friday and Saturday, were largely attended by citizens, members of the profession from outside places and by a large number of the members of the County Teachers' Association. Many of the clergy of the city and suburbs were present at different sessions of the Convention. Amongst these may be mentioned Rev. Father Tiernan, who opened the first session; Rev. Mr. Johnston, London East, who opened the second session; Rev. Canon Innis, who opened the third session; Rev. D. Ryckman, who opened the fourth session, and Rev. Mr Murray, who opened the afternoon session. Of members of the medical and other professions from outside places, whose interest in sanitary matters led them to attend the

Convention, there were Dr. W. Canniff, Medical Health Officer, Toronto; Dr. E. Playter, Editor Dominion Sanitary Journal, Ottawa; Alan MacDougall, Esq., C.E., Toronto; Dr. J. Coventry, Windsor; Dr. H. M. MacKay, Woodstock; Dr. J. L. Bray, Chatham; Dr. A. S. Fraser, Sarnia; Dr. R. R. Smith, Komoka; Dr. N. McKechnie, Thorndale.

In addition to the many visitors from within the Province, the various sessions of the Convention were graced by the presence of a number of prominent sanitarians from the United States, who found it possible to attend owing to their having been, the days previously, in attendance at the American Public Health Association, which met in Detroit. Amongst these prominent guests of the Convention may be mentioned Dr. Ezra Hunt, ex-President of the American Public Health Association, and Secretary of the New Jersey State Board of Health; Dr. Henry B. Baker, Secretary, and Dr. Hazlewood, of the Michigan State Board of Health; J. K. Allen, Esq., Associate Editor, *Sanitary News*, Chicago, etc., etc.

The Board feels that the successful character of the Convention, as shown by the above, was not more a courtesy extended to it as an appreciation of its labours, than an indication of the active and intelligent interest which the medical profession and citizens of London have for all that pertains to the public health, not only of London but also of the Province at large. The general interest manifested in all the papers, many of which had a local bearing, and the discussions which followed them, served to give to the sessions the character of a Convention in the best sense of the term; while the publication of the papers at the time in the local newspapers, and in the Toronto dailies, served to give, by their wide dissemination, a usefulness and importance in the promotion of public health knowledge, the results of which for good are not readily calculated.

LONDON SANITARY CONVENTION, FRIDAY AND SATURDAY, NOV. 16TH AND 17TH, 1883.

PROGRAMME.

FIRST SESSION, Friday, 10.30–12.30 a.m.

1. Opening Exercises.
2. Mayor's Address of Welcome, E. R. Meredith, Esq., Mayor of London.
3. Introductory Address, F. Rae, Esq., Oshawa, Member Provincial Board of Health.
4. The Typhoid Plant, its Nature and Favourite Soil, E. Playter, Esq., M.D., Ottawa, Editor *Dominion Sanitary Journal.*
5. The Water Supply of London, Prof. W. Saunders, London, Western University.

SECOND SESSION, 2.30–5.30 p.m.

1. Opening Exercises.
2. Insanity, W. Elliot, Esq., Judge, County Middlesex.
3. Results of London West Flood, Prof. W. Waugh, M.D., London, Western University.
4. The Province of Sanitary Journalism, J. K. Allen, Esq., Chicago, Associate Editor, *Sanitary News.*
5. Malaria, J. L. Bray, Esq., M.D., Chatham, Ex-President, Medical Council of Ontario.

THIRD SESSION, Friday, 7.30–10.00 p.m.

1. Opening Exercises.
2. Effects on Public Health of Mill Dams, Prof. H. Arnott, M.D., London, Western University.
3. Sewerage, W. Oldright, Esq., M.A., M.D., Toronto, Chairman Provincial Board of Health.
4. The Requisites of a Good System of Sewerage, J. Galbraith, M.A., C.E., School of Science, and Member of the Provincial Board of Health.
5. Local Health Organizations, P. H. Bryce, Esq., M.A., M.D., Toronto, Secretary Provincial Board of Health.
6. Disinfectants, W. Saunders, Esq., London, Western University.

Fourth Session, Saturday, 10.00–12.30 a.m.

1. Opening Exercises.
2. Hygienic Condition of Rural Schools, J. Dearness, Esq., Inspector of Schools, County Middlesex.
3. Hints on School Hygiene, G. W. Ross, Esq., Strathroy, Inspector of Model Schools of Ontario [now Minister of Education].
4. Infectious Diseases in Schools, C. T. Campbell, Esq., M.D., Member Ontario Medical Council.

Fifth Session, Saturday, 2.00–5.00 p.m.

1. Opening Exercises.
2. Some Reasons why so Many Persons Die of Consumption, P. H. Bryce, Esq., M.A., M.D., Toronto, Secretary, Provincial Board of Health.
3. Public Health, Dr. W. S. Harding, St. John, N.B., Quarantine Officer.
4. The greater part of the afternoon is specially reserved for the discussion of matters relating to School Hygiene.

Addresses are also expected from several members of the American Public Health Association, and of various Boards of Health.

Discussions will take place on the various groups of papers, in which it is hoped that all who attend the Convention, and who feel interested, will participate.

Local Committee:—James Cowan, Esq., Chairman London Board of Health; William Saunders, Esq., M.D.; E. G. Edwards, Esq., M.D.; J. Wishart, Esq., M.D.; C. T. Campbell, Esq., M.D.

Associate Committee:—William Oldright, Esq., M.A., M.D., Chairman Provincial Board of Health; Peter H. Bryce, Esq., M.A., M.D., Secretary Provincial Board of Health; Francis Rae, Esq., M.D., Member Provincial Board of Health; John Galbraith, Esq., M.A., C.E., Member Provincial Board of Health.

The programme as above given was, with a slight exception, thoroughly carried out. Owing to official duties taking him elsewhere, the Mayor was unable to preside at the various sessions of the Convention; but Alderman James Cowan, Esq., Chairman of the Local Health Committee, ably performed the duties of the chair. In the name of the Mayor and citizens of London, he welcomed the delegates to the Convention. He alluded to the honour conferred upon him in appointing him to preside over so important and honoured a convention composed of doctors and scientists. He considered the object of the Convention was one of vast importance to London and the Province at large. The time had arrived when certain subjects, which had heretofore only appeared before the public theoretically, should be put in practice, and the great and important work of revolutionizing and promoting the sanitation of the people at large, lay in great measure with such gatherings as he now saw before him. Any effort put forth toward the improvment of the public health, the arresting of disease and the amelioration of the condition of mankind in general, would entitle the promoters of such efforts to the thanks of the people of Canada. The chairman then referred to the presence of Dr. Bryce in their midst, and took occasion to thank the Board and that gentleman for his services so promptly rendered during the time of the London West disaster, and also for his efforts in securing for London this Convention under the auspices of the Provincial Board. The chairman, in concluding, called upon Rev. Father Tiernan to open the session with reading and prayer, which he did, and thereafter made the following remarks:—

Mr. Chairman and Gentlemen,—His Lordship the Bishop of London, who, to his deep regret, is unavoidably absent, desires me to thank, in his name, the gentlemen of this Sanitary Convention, who, through Dr. Campbell, did him the honour of inviting him to be present and to open this Convention by religious exercises.

The members of this Convention have honoured themselves as Christian gentlemen by desiring to have their important meeting preceded by prayer, and by invoking the

divine blessing on their deliberations and labours. In this way you have publicly as a body acknowledged the sovereignty of God over human affiairs, and His overruling and directing Providence. You have acknowledged that "every best gift and every perfect gift is from above, coming down from the Father of lights," and that it is "He who giveth health and life and blessing."

You are engaged in the humane and important work of promoting sanitation among the masses, of instructing and enlightening them as to the laws of health, and as to the duty and wisdom of removing those causes that scourge humanity with the miseries and afflictions of preventable diseases. You seek to lessen human sufferings, and to make men's lives healthier and happier. You endeavour to bring cleanliness, cheerfulness, health and comfort to homes where filth, disease and sorrow now hold high revel. Your work, therefore, is philanthropy in its highest form, and deserves the sympathy, encouragement and approval of your fellow-citizens.

Even in pagan antiquity men saw and recognized the sacred, blessed character of the objects your Convention has in view, for Cicero declared that "in nothing do men more closely approach to the gods than in giving health to men: *Homines ad deos nulla re propius accedunt quam salutem hominibus dando;*" and a greater than Cicero—He who spake as never man had spoken, hath promised an eternal reward to those who labour for the relief and the comfort of the sick and suffering.

The programme was proceeded with, Dr. Rae reading the first paper. At the close of the Convention a number of important resolutions, of which the following are copies, were unanimously adopted:—

Moved by Dr. Canniff, Toronto, seconded by Wm. Saunders, Esq., London: That this convention, believing that the work of sanitary reform, in order to be effective must be carried on by the efforts of the general public, strongly recommends the formation of local sanitary associations in the several municipalities of the Province. And in this connection we would express our gratification that already there exists a Dominion Sanitary Association with a promise of great usefulness. Carried.

JAMES COWAN, *Chairman.*

Moved by Dr. Oldright, seconded by Dr. F. Rae: That this convention desires to express its feeling of gratification at the presence amongst us of Dr. Ezra M. Hunt, ex-President American Public Health Association, and of Drs. H. B. Baker, and A. Hazlewood, delegates to this convention from the Michigan State Board of Health, gentlemen distinguished for their efforts in the cause of Public Health. Carried unanimously.

JAMES COWAN, *Chairman.*

Moved by Prof. Saunders, seconded by Dr. Smith: That the Provincial Board of Health be requested to prepare a series of rules on the basis submitted by Dr. Cl. T. Campbell, of London, for the guidance of teachers of public schools in cases of the occurrence of contagious or infectious diseases, and that inspectors of public schools be requested to circulate such series of rules along with their other official documents. Carried.

JAMES COWAN, *Chairman.*

Moved by Dr. Coventry, seconded by Wm. Saunders, Esq., and Resolved, That this convention is of the opinion that the Provincial Board of Health has done much to bring sanitary matters under the notice of the profession and the public, and have through their publications disseminated much information which, we have no doubt has already resulted in the saving of life, but as attention increases, so do the duties of the Board. It therefore becomes necessary that their whole time should be given to the work, and their undivided efforts secured to the country. For this purpose, we would respectfully ask the Legislature of Ontario to place such sums in the estimates, next year, as will accomplish this and other purposes, and will enable the Board to perfect the work which an intelligent people expect at their hands. Carried.

JAMES COWAN, *Chairman.*

Rev. Mr. Murray, Dr. Coventry and Dr. Smith were of the opinion a vote of thanks should be tendered the press for the excellent and full reports given of the convention, which, together with the following, were carried unanimously: Moved by Dr. Bryce, seconded by Dr. C. S. Moore, That the thanks of this convention are due to the Grand Trunk Railway authorities for their courtesy to delegates to the London Sanitary Convention in granting them reduced fares. Carried.

JAMES COWAN, *Chairman.*

Moved by Rev. Dr. Ryckman, seconded by Rev. J. A. Murray: That inasmuch as the discussions held at this convention point most clearly to the fact that all are interested in the improvement of the public health, both in its physical and intellectual aspects; and since moral and religious influences depend very largely on the progress of the physical and intellectual, this convention believes it to be its duty to urge especially upon clergymen the exercise of their influence and efforts toward the advancement of the public health, since thereby they will powerfully advance the moral and religious good of the people. Carried.

JAMES COWAN, *Chairman.*

Moved by W. Saunders, Esq., seconded by Dr. McGuigan: 1st, Being convinced of the fact that much sickness and many deaths are continuously occurring in consequence of gases and germs of disease arising from sewers and house-drains obtaining entrance into houses,—Resolved, That this convention would urge upon the consideration of the Government and Legislature of this Province the great necessity that exists for the adoption of some means whereby the inhabitants of our municipalities may have some guarantee that persons undertaking the plumbing and drainage of our houses are properly qualified so to do; and the members of the convention pledge themselves to use their individual efforts in this behalf. 2nd, This convention would further urge upon municipal authorities the necessity of availing themselves in behalf of their constituents of all such legislation, and of appointing competent persons to decide beforehand whether any dangerous feature exists in the proposed plans of the plumbing and drainage, and also to inspect the work before the house is allowed to be inhabited. Carried.

JAMES COWAN, *Chairman.*

Moved by Dr. Campbell, London, seconded by Dr. R. Smith, Komoka: Inasmuch as a large amount of the sickness and consequent suffering and death occurring in this Province, year after year, might be saved by the efforts of extra health organizations in the various municipalities; and, inasmuch as the avoidance of the pecuniary loss attendant on such sickness and death would far more than pay expenses of Boards of Health and health officers, therefore, this convention respectfully urges upon the Government and members of the Legislature the advisability of amending the Public Health Acts of the Province, as to provide that there shall be an effective Board of Health and health officers in each municipality. Carried.

JAMES COWAN, *Chairman.*

INTRODUCTORY ADDRESS.

(By Dr. Francis Rae, Oshawa.)

Mr. Chairman, Ladies and Gentlemen,—I find, by the examination of the programme of to-day's proceedings, that I am expected to offer a few introductory remarks explanatory of the aims and objects of this and similar Conventions.

We are all quite well aware that only a comparatively small proportion of the population of this, and I may add of every other country, reaches the allotted age of *three-score and ten,* much the larger proportion being stricken down by disease during the earlier periods of life.

All of you are, I have no doubt, willing to admit what experience has shown, that a

great deal of the disease prevailing in the world could be prevented, much human suffering relieved and many valuable lives saved, by prompt and proper attention to sanitary laws and regulations. We are quite unable to estimate the value even of a single life, much less to compute that of the innumerable lives destroyed by diseases induced by unsanitary conditions, which exist to a greater or less extent almost everywhere, and much of which, as has been remarked, is preventible by the timely adoption of proper sanitary precautions.

We are assembled here to-day for the purpose of considering such means as are best calculated in our judgment to improve the sanitary condition of our people. We desire in addition to the valuable papers and discussions by experts who have devoted years of their lives to the study of this important subject, to enlist the interest of as many other persons as possible, to collect into a common fund, as it were, all facts relating to the preservation of public health, from which fund each of us may carry away with him such facts and hints as may seem best suited and be most readily put into practical form in the community in which he resides for the general benefit of all.

A leading object of this and similar conventions is to awaken additional interest in sanitary matters among the people of the locality in which they are held, to induce them to offer, in the discussions, such hints and suggestions as may present themselves to their minds at the time, and thus many valuable additions are, from time to time, made to the common fund of knowledge, and such persons become interested in subjects connected with the preservation of health, and are led to enquire as to the purity or impurity of the air they breathe, the water they drink, the food they eat, the effect of other influences by which they may be surrounded, and to ascertain the part that each factor exerts in the promotion or destruction of health and life. When this desirable end has been attained each of such persons becomes a new centre from which information is imparted in a greater or less degree to those with whom he comes in contact, and thus the wave of knowledge rolls onward in the direction of universal diffusion. It is thus quite impossible to estimate the benefits that may be conferred on humanity by a practical thought which may be enunciated at a meeting such as this.

Assuming that this local interest has been excited and the general enlightenment has taken place, which it must ever do but gradually, we naturally expect to find, as we shall find, solid results flowing from them. In what directions? you may ask. Well, starting at home, we shall have the air in the house kept pure by some simple and yet efficient system of ventilation; we shall have the air external to it, kept pure by the removal of filth from our yards and the prevention of its accumulation there by properly storing it; we shall further have it kept pure by the removal of the many public nuisances so common about our towns, and in the same way by a comprehensive and efficient sewerage system, have this very common source of bad air and disease removed. But further, in the direction of checking diseases which have actually broken out, we shall then carefully adopt, under the direction of physicians and health officers, isolation and disinfectant precautions wherever a case has occurred. If such disease is known to have affected any child at school it is imperatively demanded not only to remove such child from the school but to prevent others who may come in contact with it from being the bearers of infection. Our teachers, in this regard, will be our most active and effective workers, while every intelligent and conscientious citizen will endeavour as carefully to defend others from having the disease carried to them from his house, as he would wish to be protected from having it conveyed to his family from others. Thus we see that in these many ways happiness, health, and general prosperity will be greatly advanced, and the inhabitants of our country be the conscious recipients of Hygeia's gifts.

"Public Health."

(By Dr. W. S. Harding, St. John.)

My Dear Dr. Oldright:

Your favour of August 28th received. You ask if I can give you a paper for the Sanitary Convention at London, in November. * * * I shall make some remarks on some of the points relating to public health, addressed to you as a communication, which you can read or make use of at the Convention, should you think the matters are dealt with so as to be worthy of occupying attention. * * *

Wm. Oldright, Esq., M.A., M.D.,
Chairman Provincial Board of Health of Ontario:

Dear Sir,—In compliance with a promise to you when acknowledging receipt of a copy of the "First Annual Report of the Provincial Board of Health of Ontario," which you so kindly sent me, I now propose making some remarks in reference to it, and the subjects dealt with in the Report.

A leading feature of your Report is the stress laid by all the members and contributors of matter, on the necessity of diffusing sanitary information among the *general public*, in order to secure their co-operation in efforts for preventing and suppressing disease. You fully recognize the necessity of the general public becoming *active* agents in their own preservation. In fact without such co-operation all our means will but little avail. In this direction compulsory enactments cannot be a substitute for intelligent voluntary action.

Those who have applied themselves to the task of imparting information of this kind to the general public, know full well that the same facts must be stated and re-stated over and over again, and as a final result more and more of the laity will apprehend the importance of the facts, and *feel* the propriety of taking the action required. It does not follow from being a many times—more than "twice"—"told tale," that it must necessarily "vex the dull ear." On the contrary, as your Report illustrates, the recital of the facts can be made exceedingly interesting as well as profitable towards securing exemption from disease.

The "First Report," through the various articles, has taken in, or touched upon, the whole field, we may say, of knowledge pertaining to the subject, displaying such an amount of research, and such correct judgment as must entitle the workers to fullest approval. Having done this, what is next to be done?

We must bear in mind the difficulty of creating and keeping alive an interest, so essential to success, considering that apathy is the usual state of mind regarding matters of this sort: they are habitually lost sight of, although their importance is not denied.

If this be true "to have done" is not sufficient. The matters and facts having been presented as mentioned must be taken up in detail, and each of the leading facts made a subject of special treatment. The subject of public health is not only susceptible of this handling, but there is an absolute necessity of giving it such, so as to get those facts which are the basis of sanitary science instilled into the minds of the largest possible number of persons, to guide, and induce them to take the action required under various circumstances in the interest of the whole of the people.

This way of dealing with the matter, in effect to make each of the cardinal facts the theme of a monograph, which is so much the method of the day in most branches of knowledge, and for example in the direction of public health, the pamphlet of the late Sir J. Y. Simpson, on "Stamping out Small-pox and other Contagious Diseases"—by isolation; "Abolition of Zymotic Disease,"—by isolation, etc., by the late Sir Thomas Watson.

Acting on such view of the case, I propose making some remarks on two of the questions proper for sanitarians to consider.

At the Convention held in St. Thomas, Ont., Sept., 1882, Rev. Professor Austin is reported among other things to have said :

" But while giving physicians their due credit, it may justly be doubted if they can ever be the *chief*, [italics mine] much less the sole agents, in this work of sanitary education and reform. Some of their number are as little interested in matters regarding public health as those who know less of the sufferings and needs of society. Many of the most talented are worn out with professional duties, and all of them from the very exigencies of the case have to restrict their work, chiefly to the treating of the sick, and leave the work of instruction and warning the masses to other hands."

As the above statements, addressed to the laity, involve questions of much importance, not fully understood by the laity, their discussion before the public is desirable.

One such question is : Can ordinary non-professional people sufficiently understand public health matters—not having studied medicine?

I hold that such of the laity as give the subject consideration, and study it, can understand it : that knowledge strictly medical is not absolutely necessary thereto, admitting, however, that the possession of such would be an advantage in considering the facts and questions.

Another point which the remarks of Professor Austin bring up—the competency of medical men who have never studied or specially considered public health, properly to judge of things relating to it?

I consider that such of our profession are not properly qualified so to judge, that is to say, merely from the possession of general medical qualifications, and from being practitioners of medicine.

It can be said the views expressed by the Rev. gentleman are in a general way correct, but not in all respects. He observed : " It may justly be doubted if the physician can be the *chief* agent," etc.

My opinion is that from no other class can the *chief* agents be furnished to advise and teach the other classes of the community ; hence the propriety of all Boards of Health being largely composed of medical men, who of course should have public health qualifications—facts now generally recognized and acted on. I agree with the speaker that the physician cannot be the *sole* agent ; and accept his reasoning explaining the non-possession by very many physicians of public health knowledge.

As you will perceive, these remarks are merely intended to qualify those expressed in the quotation, but instead of further discussing all the points referred to by Professor Austin, I will, with your leave, dwell somewhat on one point connected with this subject, which most people can admit to be important, viz., the competency of such of the laity as have never of their own accord given much, if any, consideration to the requirements of public health to understand what their authorized teachers have to say to them about the matter, and what they are expected to do so as to fulfil their obligations as citizens.

Advice of this sort, I assert, all persons possessing the smallest modicum of common sense can perfectly understand, if willing to take the trouble of considering it—doubting which would be to declare all efforts of sanitarians as utter folly. In any case, however, that the advice of such authorities is not intelligible, some flaw in the teaching should be assumed to exist—the test of the quality of which must be that it is intelligible : Neglect to act as advised does not in general arise from inability to understand, but from various other causes, among which may be mentioned somewhat of the perverseness which pertains to humanity, and hinders in every direction that being done which is known to be right and best. To such as these some coercion will be wholesome. Others again there are, perhaps well intentioned, but who allow a *vis inertia* to hinder them from acting up to the knowledge they possess. These will need to be roused by some of both coercion, and appeals *ad hominem*.

It is owing to these and other causes not necessary to dwell on, that the work of the sanitary teacher and authorities can never be called finished so that they may rest from their labours, these labours, however, differing from those of the fabled Sisyphus, in that the sanitarian all along will accomplish somewhat of his object.

In truth no plea can be accepted on the ground that the instruction and advice of

the sanitarian is difficult to understand. That the advice and method of giving it to the people of Ontario is of the kind required, and will stand the test mentioned of being intelligible, is fully shown by the circulars your Board of Health distribute when infectious disease is present, telling what to do, and how to do it.

In the first place the infectious property of certain diseases is what everybody knows as a fact, and which even the instincts of all persons might help to induce the action required to ward them off, without much special instruction. We marvel therefore that there should be neglect. The prescription is simple and can be stated in a sentence—shun such diseases, or to speak more strictly, put the sick of them aloof—isolate them.

Returning to the point now mainly in consideration, the ability of all classes of the laity to understand, for all practical purposes, the chief facts of public health, but especially that one under which almost the sum of their obligations rest, viz., the infectious property of certain diseases, and the necessity of avoiding them, to do which will be *in a measure* to obey the instincts in their presence. It is not contended that people should blindly at such times act upon the promptings of instinct; but that it may serve a good purpose in predisposing them to heed and act on the advice of those qualified to give it.

Before concluding, a word or two more regarding a portion of the laity referred to as having *studied* public health: These it may be asserted can perfectly well judge in questions relating thereto, and I believe it would be wise to encourage this portion of the laity to have confidence in their ability properly to judge of public health questions.

"The evidence lies on the surface of common events, and the conclusion to which it tends, so far from transcending ordinary apprehension, is often so salient as to force itself on the mind, even of the vulgar, on the first view of the facts."

There seems much need of such self-reliance on the part of those referred to, because they must *help* to decide many important questions; to advise the other classes of the community; from time to time to secure legislation required; and when thus considering the subjects, they are often staggered by what may seem diversity of opinion among medical men on public health questions, and hence a diffidence in trusting themselves to judge when doctors differ. When they do, who shall decide? We have never heard the answer "who," but there may a partial one be given, by saying, in questions of this kind, such of the laity as have studied public health might help to decide—and be a sort of balance-wheel. This for the reason before stated, viz., that all medical practitioners are not necessarily versed in the subject of public health. In fact opinions in this direction should be considered of value, be they of medical men or laymen, only in so far as they can be demonstrated sound to the mind of those (the general public) to whom all public health questions are supposed to be addressed, and for whose benefit it is asserted they are brought under discussion before the public.

With your leave I shall make one other allusion. An important event to be noted is the comparatively recent acquisition of ladies as advocates of, and workers in, the cause of public health—a fact the importance of which can hardly be over-estimated.

As my communication has got to be of greater length than I intended, I must beg you will pardon the inadvertence.

I am yours faithfully,

W. S. Harding

The Typhoid Plant and its Favourite Soil.

(By Dr. E. Playter, Ottawa.)

Mr. Chairman, Ladies and Gentlemen,—That a living micro-organism of a vegetable character—a sort of mould or mildew—is the principal factor in the causation of typhoid fever seems to be so plain and indisputable that in the few remarks I have to make before you here, to-day, I may as well regard it as no longer an hypothesis but an established fact. This organism has been aptly, and properly enough, called the typhoid plant.

It seems evident that we can no more have a case of true typhoid fever, without first a deposit, development, growth and multiplication, in the human body, of this specific organism, than we can have a stalk of celery in the garden without having first deposited in the soil the seed of the celery plant.

As it seems that this plant seeks out, as it were, or selects for its most complete development, and for its victims, human beings in the very prime of their existence, so many men especially, and women, succumb to it at this period of their life, we may regard typhoid fever as one of the most important diseases, and, with the exception of consumption, it is probably the most important disease with which we, in Canada, have to deal. And, as it is pre-eminent in this regard, so it is perhaps the most preventable of our ordinary infectious diseases. A general diffusion, therefore, of knowledge relating to the cause, or causes, and the development of the disease is very desirable indeed, and most essential.

The typhoid plant has been usually recognized as consisting of short, plump rods, with rounded ends. The rods are from $\frac{1}{3000}$ to $\frac{1}{4000}$th of an inch in length, and are called *bacilli* (a Latin word, signifying a small stick or staff); these, frequently forming structures of two or three, or more, rods, as if linked together in a chain-like manner. The yeast plant and the conferva are of somewhat similar structure, and appear to consist of simple cells strung together like jointed threads. In some parts of the human body, as in the glands of the large intestine, where they become very numerous, typhoid vegetation is found, after death from typhoid fever, in clusters, called micrococci, and as if they had grown together in branched masses, resembling collections of minute thread-like rootlets. These organisms belong to the very lowest types of life, and develop and multiply by means of spores, bodies analogous to the seeds of the higher vegetable growths. It is well known that all these low, simple forms of life, such as mildews and blights, multiply, and spread with marvellous rapidity. In an incubator under a powerful microscope, the minute rods, or baccilli, which give rise to splenic fever (common in domestic animals on the continent of Europe), have been observed, in a drop of serum of blood, to grow, in a few hours, into long threads, from twenty to a hundred times as long as the original threads. After a time the threads assume a dotted appearance, and the dots increase in size and distinctness, until after a period of from fifteen to twenty hours from the commencement of the experiment, they seem like distinct oval bodies, at regular intervals along the threads. These oval bodies are the spores, and are soon set free when they sink to the lower part of the drop of serum. With additional nourishment, they elongate into rods exactly resembling the original, or parent bacilli.

It is now almost universally believed that the symptoms of typhoid fever are due to the development, growth and multiplication in the fluids and tissues of the body of these plants. They have been found by investigators in the intestinal canal, spleen and lymphatic glands of a very large proportion of the bodies examined after death from typhoid. In diphtheria, there are patches of growths of a somewhat similar organism in and about the throat, producing ulcers and membranous formations. In typhoid fever, Wernich concludes, from his own and other researches, "that the essential phenomena of the course of the disease and the most serious symptoms depend primarily on the numbers of the bacilli, or on repeated invasions of the digestive organs by them. The subsidence of the special symptoms on the eleventh to the fifteenth day corresponds with the dying off of the nests of bacilli, after which time, unless there has been a fresh invasion, it is often impossible to prove the presence of bacilli. According to Eberth, the number of the bacilli is greatest about the twelfth day of the disease, after which it steadily declines to the end of the third week; only exceptionally are they found up to the fifth and sixth weeks." Eberth found them always most abundantly in the lymphatic glands in the first portion of the large intestine. He believes that the mucous membrane of the intestine is the regular path of the access of the typhoid bacillus into the human body, whence it spreads to other parts of the organism.

I have said that this bacillus is evidently the principal factor in the causation of typhoid fever. It is doubtless the essential factor. But it appears probable that there are others, or at least one other: or else why is it that after two persons have been

equally exposed to the infection, one takes the disease and the other escapes it? Why will the plant itself or its spores take root, so to speak, develop, multiply, and give rise to the disease in the one and not in the other? Dr. Alfred Carpenter some time ago put forth the hypothesis that there are three factors in all zymotic diseases, such as typhoid fever: One, the specific contagion (in this disease the typhoid plant); another, the meteorological condition of the atmosphere; and a third, an excess of used-up or waste matters in the fluids of the body, these waste matters having been but imperfectly removed from the blood by the excretory organs—the skin, kidneys, liver. He doubts if the contagion of disease would have any effect upon the body if the recipient of the contagion were perfectly healthy; if there were no impurities in the fluids of the body. Some such explanation is necessary in order to understand why the plant ceases to grow and multiply in the body after a certain period of time, in cases of recovery from the disease. Were there not one other factor at least, one other besides the natural structures or fluids of the body, why, when the plant once takes root there, does it cease after a time to grow and multiply? There must be, it appears, something in the bodily fluids which supports the life and growth of the plant for a time—something upon which it feeds, and which eventually becomes exhausted. This cannot be any natural substance essential to health, or health would hardly be so readily established again after the invasion of the parasite. It must be some non-essential substance. Are we to suppose that the human body in a healthy, vigorous condition contains non-essential matter, such as parasites feed upon? It is not likely, if possible. We know that individuals often have better health after an attack of some fever that they had had previously to the attack. Have the parasites removed from the body some foul substance which ought not to have been there? Possibly. We might, on this view, regard these fever plants as friendly scavengers. However this may be, without the specific contagion—the living organism, there would be no typhoid fever. While, moreover, on the other hand, it may be said that, with careful, strict attention, individually, to the laws of health, in regard to the air breathed, the food, the clothing and care of the skin, and to general habits of life, the risk of the body being invaded by the typhoid plant, or, indeed, by any other parasitic organism, would be reduced to a minimum.

While we should not neglect personal hygiene in any case, the surest way to prevent Typhoid Fever is to prevent the development and growth of the typhoid plant—to destroy it, to starve it out, to deprive it of soil and nutriment. We cannot pluck it up as it shoots into form, as the farmer does the stalks of the wild mustard plant; we cannot choke or smother it out, as the Canada thistle is destroyed by continually ploughing it down, but we can deprive it of the soil on which it most flourishes—deprive it of the food necessary for its growth and increase.

Now, what is this soil? What is this food? Belonging to this class of organisms are many species which have been grouped together under the name of *saprophytes*—from the Greek, and signifying that these organisms live upon decaying organic matter. Where there is no decomposing, waste, organic substances, there will be no saprophytes, no bacteria, no typhoid blight; nor will there be, it may be observed, the specific organisms which give rise to diphtheria and other infectious diseases. "To get rid of the filth," as it is said, "is to get rid of the fever." And there is no truer saying. We know that most organisms—vegetable or animal—have some special or favourite locality, soil and food on which to live. Some special moulds seem to delight most, if I may so express it, to grow upon cheese, others upon pots of jam. Amongst the higher organisms we find the fresh potato plant is the favourite place and food of the Colorado beetle; and the same choice in this regard is manifested in other animals, even up to man himself. It is almost as plain as can be, and I am persuaded, that human fecal matter is the favourite and the principal substratum on which, and in which, flourishes, in its highest state of perfection, the typhoid plant. Both in the body and out of it, it is found to be most closely associated with these excreta.

At this point it becomes necessary for us to notice some other points relating to the nature of the typhoid plant. With a view of obtaining information bearing upon the origin of Typhoid Fever, I sent out, some months ago, to a large number of medical practitioners throughout the Dominion, the following questions:—

1. In your experience, or so far as you have observed or recollect, in cases of well-marked Typhoid Fever, have you nearly always, most commonly, or only rarely, been able to trace its source as from another case of Typhoid?

2. In other cases, have you, in a large proportion or in a small proportion, observed that the origin seemed to, or may, have been associated with excreta, especially human excreta, as in privy vaults?

3. Has this medium of communication usually seemed to have been the air or the water?

A large number, it was satisfactory to find, replied to these questions. To the first question, that concerning the source of the disease being another case of Typhoid, about sixty per cent. answered "only rarely." Only rarely were they able to trace its source as from another case of the disease direct. About fifteen per cent. wrote "commonly." The remaining twenty-five per cent. were nearly equally divided between such replies as "very frequently," "commonly," "about one-half." So that considerably more than one-half had "only rarely" been able to trace their cases of Typhoid Fever to other cases of it. Most of their cases had probably had some other origin.

To the second question, relating to the connection of the disease with fecal matter, nearly sixty per cent. answered "a large proportion;" twelve per cent. answered "commonly" or "frequently;" about twenty per cent. wrote "small proportion," and the few remaining wrote "rarely."

To the third question, was the medium of communication, the carrier of the poison, air or water? eighty-two per cent. believed the medium to be usually water; the remainder, eighteen per cent., thought it usually air.

So that the medical evidence in this enquiry was very largely to the effect that cases of Typhoid are only rarely caused by contagion coming direct from another case of Typhoid, but frequently from excremental matter, and through, or by means of, water contamination.

May there not be in this something analogous to the reduced virulence, by cultivation, of the vaccine virus and the contagion of Splenic Fever? Considering the phenomena connected with so-called "sewer-gas," and the air in the vicinity of collections of fecal matter, we can hardly doubt as to the substratum or soil, on which the typhoid parasite grows and is given off just before it passes into the human body—can hardly doubt that it is fecal matter.

More than seven years ago a physician and writer of high standing wrote to a leading London medical journal on the cause of Typhoid Fever. "How long," he wrote, "will etiologists continue to resist the conclusion that the infective agent of Typhoid is derived from a specific mildew, occurring on fecal matter." It seems as plain as can be that the contagium of Typhoid, whatever it is, is most intimately associated with fecal matter. Scientific research proves that the contagium itself is a very low form of vegetable growth—a sort of mould, or that it is most intimately or inseparately connected with such a plant.

As the above named writer observes, "nothing is clearer than that most of these low terrestrial organisms will not only sustain themselves when they are accidentally immersed in fluids containing nitrogenous matter, but will multiply rapidly under the abnormal conditions."

The vegetation found over and over again in the intestines and other parts of the bodies of those who had died from Typhoid Fever, is the water condition of the plant, and by cultivation on the free surface of a suitable soil, it reverts to its original or mildew form. "It is, then, a warrantable scientific inference that the vegetation in the Typhoid tissues is a casual and degenerate stage of its existence, and that its true, or highest or original form, is that of a mildew growing on a free substrate."

"Other animal and vegetable matters may occasionally be overrun by this specific mildew of Typhoid, and may thus cause the surrounding atmosphere to be charged with particles of mildew. The toxical properties of these particles may be modified by the qualities of the substratum; but it is probable they will, if imbibed, cause some or more of the typical symptoms and lesions of Typhoid. Hence, possibly, febriculæ and bastard or obscure forms of Typhoid. The one great substrate, however, which has supplied the Typhoid mildew in all ages and in all countries, is fecal matter. By this hypothesis every

phenomenon which has been observed in every epidemic, and in all isolated cases of the disease, may be clearly interpreted. For instance, the celebrated Munich problem, which has exercised Professor von Pettenkofer for so many years, admits of the readiest solution by this mildew on fecal matter. Granted that the rise and fall of the ground-water governs the Munich epidemics, and that Typhoid rages most when the water is lowest, as the water falls in the privy-shafts, the excrement surface for the mildew increases, and, as a consequence, the air is poisoned to a greater extent. When the water rises, the substrate adhering to the sides of the excavations is covered, and the mildew swamped."

It appears evident, moreover, that in the water phase of this plant it will develop and multiply in milk. Hence the origin of epidemics of Typhoid through the milk supply.

A few words, in conclusion, on the spontaneous origin of Typhoid and other fevers. No one here probably believes in the purely spontaneous origin of any living organism, notwithstanding some imperfect evidence to the contrary. If spontaneous origin is understood to mean the specific mildew itself, and the disease arising simply from unsanitary surroundings—filth without the germ—the spores of this specific mildew having been first deposited there, few believe in spontaneous origin. It is not difficult to understand, however, that portions of the vegetation, perhaps the spores, after being exposed to the air and dried, may be carried by the wind, occasionally, possibly, a long distance, and be deposited on favourable soil, such as has been indicated above, and there develop, grow and spread, and give rise to the disease in any hapless human being who might receive a germ into his unsanitary-conditioned body. It is not at all unlikely, indeed it is probable, that this Typhoid mildew, in its highest state of existence, may develop from the spore and germ, and multiply outside the human body. In this way may be explained the seemingly spontaneous origin of Typhoid Fever in neighbourhoods in which it never had been known to exist before.

The Water Supply of London.

(By W. Saunders, Esq., London.)

Any reference to the water supply of our city would be incomplete unless it included the past as well as the present character of this important element, so potent in its influence on the health and comfort of the community. The past supply is not altogether abandoned, since there are still quite a number of our citizens who cling to the water furnished by their wells with great tenacity, and who would think themselves grievously imposed upon if they were obliged to close them up.

Past Supply.

The nature of the underlying strata in the territory covered by our city varies very much in its character. In the eastern and northern portions that near the surface consists chiefly of beds of sand and gravel, while in the south and west, clay is predominant, and as the water, contained in the wells sunk in these strata, is accumulated there almost entirely from the percolation through the soil of the rain-water which falls on its surface, the character and relative purity of such supplies must be largely affected by the nature and composition of the material through which it has to pass. The clayey deposits consist chiefly of oxide of alumina with varying proportions of oxide of iron, silica and carbonate of lime, which have been detached, in the earlier ages of the world's history, from rocky beds, and gradually reduced to a fine state of division by the erosive forces of nature. The sand and gravel beds are mainly made up of fragments of limestone, mixed with more or less of fragments from rocks of an igneous or plutonic character, similarly comminuted. Water passes readily through the latter and is filtered, and, to some extent, purified in its course, while, at the same time, it exerts a solvent action on the material through which it passes. The sticky nature of the clay deposits offers a more or less effectual bar to the passage of fluids, depending on their relative compactness and tenacity. On the surface, and for some distance under it, there is usually a copious

supply of vegetable and animal matter undergoing decay. This decay is slow combustion, and the main products are much the same as in the case of rapid burning. The process is largely a union of oxygen gas with carbonaceous material, gradually resulting in the production—along with other substances—of a large quantity of carbonic anhydride, better known as carbonic acid. This acid, which at ordinary temperatures is a gas, consists of two atoms of carbon united with one of oxygen; it is absorbed to some extent by the soil, and is freely soluble in water. Carbonic acid is also constantly eliminated from our bodies as the result of the combustion continually carried on there, and by which the animal heat is maintained. Add to this similar exhalations from other members of the animal kingdom and the still larger quantity produced by the numerous fires maintained for heating and manufacturing purposes and it is easy to see that the sources of carbonic acid are everywhere present, and in ample proportion. Water charged with this gas has a much stronger solvent action on limestone, whether it presents itself in the form of rock, boulders, gravel, or sand, than water not so impregnated. Rain-water, as it falls, takes up in its passage through the air a portion of the carbonic acid existing there, and, falling on the soil, absorbs still more while passing through its porous surface. It is evident then that it would be almost impossible for rain-water, under such conditions, to fall to the ground and percolate through from fifteen to one hundred feet of finely comminuted earthy material without dissolving some portion of it. Hence we find that well water varies much in the proportion of its earthy impurities; within the city it ranges usually from 25 to 60 grains, or more in the imperial gallon of 10 lbs., while from other localities I have known it to contain occasionally over 100 grains in the same quantity.

The water found in wells within any given district where the underlying strata are sand or gravel, is, as a general thing, tolerably uniform in its character, but in sections where clay predominates it is most variable, partly arising from the varying character in the composition of the beds, and partly from the sudden changes in the relative position of these stratified deposits, hence one person in such localities may have well-water of very fair quality, while that of his neighbour may not be fit to drink. In short, before the present public water supply was obtained, the citizens of London were supplied with water of ever varying quality, often containing, in addition to the earthy constituents, more or less of organic matter, derived from decomposing filth in every form. Faults in the condition of the underlying strata, arising from the fact that some portions were less impervious than others, would also greatly affect the character of the water in some wells. It also varied much in cases of abundant and rapid rainfall. Where rain is precipitated in torrents the soil soon becomes so saturated that the water passes freely into wells, draining into them nearly at their surface, hence a water ordinarily good may after a heavy rainfall become quite unfit for use.

As the population of a city multiplies, and especially if the system of sewerage is at all imperfect, the danger of using well-water is greatly increased, for with underlying strata so variable in their porosity, it is impossible to say how rapidly or how far the soakage from collections of filth and decomposing matter may extend. Enough, I think, has been said to illustrate the point I wished to impress, namely: the ever-varying character of water derived from such sources, and the danger to health arising from the use of it.

Present Supply.

The extensive series of springs which furnish the excellent and abundant public supply with which our citizens are now provided, while flowing from the surface, evidently arise from some other than immediate surface sources. The uniform quantity they yield points to this. Amid the drought of summer, as well as when rain is abundant, the supply does not perceptibly vary. In the proportion of earthy constituents held in solution, it is also practically unvarying, no matter what season is selected for the examination; it is also almost entirely and uniformly free from organic matter. Further, it contains a far less proportion of earthy constituents than any surface supplies I know of in this vicinity; for, while no well which I have examined about the city will yield less than 25 grains to the imperial gallon, this supply uniformly gives about 15½ grains.

London is situated on a large drift deposit which extends for many miles on either side; indeed, it covers the greater portion of this western section of Ontario. Underlying the drift, which is composed of immense beds of sand, gravel, clay and other similar deposits, is the rocky foundation upon which they rest, a limestone, rich in fossil remains, and known to geologists as the corniferous limestone. This rock comes to the surface at St. Mary's, where it is exposed in the river bed for about a mile and a-half above and nearly the same distance below the town. Another exposure occurs at Goderich and a third at Malden. Elsewhere it is covered with the drift referred to, the depth varying with the configuration of the surface and the sweep of the rock below. The corniferous limestone is very subject to great variations in its contour, sometimes approaching the surface and again dipping far below it; often forming large basins, which, being impervious, constitute natural reservoirs capable of holding immense quantities of water. Travelling south we reach a watershed about ten miles from London, where there is found the highest land between the city and Lake Erie. We may presume that all the water falling on this side of the ridge moves in this direction, that on the other side courses towards the lakes. East and north-east the land gradually rises for 20 or 30 miles, or more, until it reaches an altitude in some places 200 feet or more above London, shedding its rainfall in this direction until the highest point is passed between here and the lakes. Within this large area an immense quantity of water falls annually; part of this is carried away by rivers and streams, all of which, however, lose some portion of their volume by soakage through the gravel beds which they traverse; the remainder is retained by the soil, and much of this passes through the upper strata and gradually accumulates in vast stores beneath, so great that their limited natural outlets are but little liable to vary with the changes in the seasons which seriously influence more superficial accumulations. The purity of the water in these natural reservoirs will depend much on the nature of the strata through which it has passed, but most of the area referred to being devoted to agriculture, water filtering through the soil would not be likely to contain the same proportion of inpurities as that found in and near large cities. Along the surface of the rocky bottom, underlying the drift, occur beds of gravel, more or less continuous, through which the water percolates freely, passing from the higher to the lower situations towards its natural outlets. From some such source our city supply must come, and it need not excite surprise that the quantity should be so great, and the quality so uniform, when we consider that the vast bodies of water contained in our great lakes are derived also from rainfall.

The water is just of such a character as one might expect if it were obtained by soakage from Lake Huron, but the fact that our springs at their outlet are 180 feet above Lake Huron disposes effctually of any theory in this direction. Neither could it originate from any of the other large bodies of water above us to the north or east, for its source is 158 feet above Lake Superior, 126 feet above Lake Nipissing, and 56 feet above Lake Simcoe.

About five miles east of the London water-works is a well from which the London asylum is supplied, which is practically inexhaustible. 500,000 gallons have been pumped in a single day without lowering it much. This well was originally sunk with the intention of going deep enough to secure, if possible, a flowing well. At about 120 feet the bottom of the drift was reached, and drilling commenced through the rock below. The drill was kept steadily at work until a depth of 2,215 feet had been reached. At this point a vein of sulphur water was struck, which being unfit for use, it was resolved to abandon the drilling, plug the hole in the rock, and draw from the gravel bed overlying the rocky surface. The result was most satisfactory and an abundant supply of very pure water obtained, holding a little less than 12 grains of earthy matter to the gallon in solution. Of late a test well has been sunk to the surface of the rock in London East, with the idea of securing thus a supply of water for that town. In this instance thick beds of clay containing boulders extended down to the rock, which was struck at 110 feet below the surface. At this point the clay was associated with a small proportion of sand, and water flowed into the well in considerable quantities. But the clay beds, with this additional element of porosity, did not allow the water to pass into the well with that rapidity which was needed to make it a success, and hence it has been abandoned. The

water, however, was intermediate in the proportion of its earthy constituents between that at the asylum and that obtained at the water-works, showing a little over 12 grains to the imperial gallon. In this well the water as it rose washed off from the clayey sides some of the finer particles of clay, sufficient to make it slightly milky, but if allowed to rest a day or two, or if filtered, it became quite transparent, and in every respect much resembled the water with which London is supplied. The marked similarity in the water obtained from these three different sources within an area of five miles, and the fact they are each so much freer from foreign matter than any of the superficial wells which have been examined in the same district, strongly indicates their common origin, and I think there can be little doubt but that the springs at the water-works are supplied directly from the gravel beds overlying the rock, the water, on account of obstacles to further progress in the nature of the strata, being forced to the surface at this point.

The quantity of water available from the springs under control is about two millions of gallons per day, while adjoining springs which might be utilized, if required, would add to this one and a-half millions more, making three and a-half millions in all. The average consumption during the past summer has been about one and a-quarter millions of gallons per day. The construction of a dam in the river adjacent to the springs gives an immense water-power, by which a series of pumps are worked, having a pumping capacity of three millions of gallons in the 24 hours, and this at the trifling cost of $1,000 a year for keeping the dam and machinery in order and another $1,000 for wages. Steam pumps have also been provided, which can be used in case of accident, having a pumping capacity of two and a-quarter millions of gallons, but their use adds $1,000 annually to the labour bill, and entails an additional outlay of about $4,500 a year for fuel. This $5,500 is annually saved by the use of the water-power.

The hill adjacent to the springs, on which the reservoir has been built, is sufficiently high to give a uniform pressure at the City Hall of about 80 lbs. to the square inch and about 65 lbs. in the highest parts of the city. This admits of a stream of water being thrown over the loftiest buildings on the most elevated points with no other power than the natural pressure, thus providing from the hydrants a most efficient and economical protection from fire in every part of the city. Further, this pressure is utilized to a considerable extent as a motive power, and will doubtless be still further used in this direction when its advantages are better known.

The by-law authorizing the construction of the water-works was passed on the 14th of December, 1877, the contract for the work was given in April, 1878, and the first water supplied to the citizens on the 20th of November of the same year. So much opposition was manifested to the by-law that it was found necessary, in order to secure its passage, to leave it optional with the inhabitants whether they would take the water or not which was to be carried past their doors in the pipes on every street. It is interesting to observe how this water-supply has commended itself even to many who at first opposed it, and how it has grown in favour from year to year. At the end of the first year, 1879, there were 980 consumers, and the revenue derived therefrom $6,600; by the end of 1880 the number of consumers had increased to 1,270, and the revenue to $12,600. The close of 1881 showed 1,799 consumers and a revenue of $16,590; 1882 an increase to 2,298 consumers, with a revenue of $20,270, while at the present time there are 2,697 services, yielding an annual revenue of about $25,000. The total expense of carrying on the work, with the use of water-power, is about $5,000 per annum; with steam-power it would be about $10,500; in either case showing a gratifying margin of profit to be applied towards meeting the interest on the cost of construction and the extension of the system.

It can be safely asserted that London has one of the best and healthiest water-supplies in the world, and such a boon as this is should be participated in by everyone placed within the reach of it, and I am strongly of opinion that, as the advantages become better understood, none will be found willing to jeopardize their health by using water comparatively impure and of variable character, when so pure a supply in such abundance is at hand.

Insanity in its Relations to Criminal Law.

(By Judge Elliot, London.)

Insanity in its relation to responsibility for crime is a subject which has called forth some acrimonious discussion between members of the professions of law and medicine. The mind revolts at the idea of making persons responsible for their acts who, by mental disease, are devoid of reason. But the difficulty is to ascertain at what point of mental disorder responsibility should cease. The line which separates sanity from insanity has never been defined with precision, and probably never will be. Jurists have not done it, and I am not aware that physicians have been more successful. Whenever any one has attempted to give anything like a formula on the subject, it has led to numerous exceptions and objections. Insanity, like other diseases, has its stages of intensity. When it appears in its severest development, so as to leave no doubt whatever of the unfortunate one being wholly bereft of reason, the case is plain enough. But when he is only in an intermediate stage there is difficulty in determining at what point responsibility ends. This difficulty is, I believe, greater in theory than in practice. For it will be found, I think, that juries, by whom the question of responsibility or irresponsibility for crime has to be decided, are inclined to take a broader view of the subject than the formula adopted by jurists would seem to indicate. I shall have to advert to this point presently. But before going further, I would say with reference to the angry controversies that have taken place between the members of these professions on this subject, that I believe they have sprung from an honest desire upon both sides to promote the cause of justice. That these discussions have been angry is well known. Thus Dr. Mandsley, in the preface to his work on responsibility in mental diseases, speaks of "the scorn and indignation felt by those who observe with impatience the obstinate prejudice with which the English judges hold to an absurd dictum which has long been discredited by medical science." And Sir James Stephen, an exceedingly able jurist and judge, in relation to criminal law, says: "It certainly should be said in extenuation of the violent language which medical writers frequently use upon this matter, that they are sometimes treated in courts of justice, even by judges, in a manner which I think they are entitled to resent. Sarcasm or ridicule are out of place on the bench in almost all conceivable cases, but particularly when they are directed against a gentleman and a man of science who, under circumstances which in themselves are often found trying to the coolest nerves, is attempting to state unfamiliar and in many cases unwelcome doctrines to which he attaches high importance."

I remember hearing a lecture delivered in this town by a medical man who had paid much attention to this subject, and who deservedly, I believe, stood high in his profession. I thought he was rather severe upon the lawyers, especially upon the judges. I said to myself, "It is all very well to discuss those fine, obscure and intricate disorders of the brain and their effect on the actions of men, in a lecture, but it is a very different thing to instruct a jury in a plain and intelligible way as to the points they are to consider in arriving at a verdict." It is easy to perceive that some plain formula by which to guide a jury, if it possibly can be had, is far more likely to be efficacious and salutary than the intricacies of medical science. Judges are not to be blamed I think for receiving with doubt and suspicion excuses put forth for heinous crimes on the ground of insanity, based upon novel theories, some of which appear to go the length of maintaining that all crime originates from disease of the mind.

The simple question in this department of jurisprudence is this: Is the person *responsible*, which in the eye of the law means, is he liable by the law of this country to be punished for what he has done? This word *responsible* is sometimes, indeed I think very generally, used as if it meant moral responsibility. But a judge can only interpret the word in one way and that is, is it proper that this person should be punished for having broken the law of the land? If he is clearly insane he certainly ought not to be punished. But here comes the difficulty: he may have eccentricities, he may labour under one or more delusions, he may at intervals exhibit a frantic state of mind, or he

may talk incoherently and wildly; he may have shattered his fortune by throwing his money into the sea; he may have worn an iron girdle round his body, producing unremitting pain, like the illustrious Pascal; he may have jumped overboard in mid-ocean and been rescued against his will; in fact, there is no end of vagaries and hallucinations which he may have exhibited, and yet the question remains, should he break the criminal law, is it fitting that this man should be punished? Now, I think there is a strong body of medical testimony to show that such a man ought not to be punished. It would be presumptuous of me to profess an extensive, much less a profound knowledge of medical testimony in relation to this question. But I think I may say that there is a strong body of medical opinion that such acts as I have mentioned warrant a more comprehensive definition of this insanity, which should shield from punishment than it usually receives in the courts.

This brings me to the question, What are the directions usually given in the courts by judges to the juries on this question. I will refer to a few of these. One celebrated case was that of Lord Ferrers, who was charged with the murder of his steward. Lord Ferrers was a strange, excitable man; at times he seemed incapable of controlling his acts, and insanity was set up for his defence. But there was some evidence of deliberation, and it was considered that, notwithstanding his occasional apparent aberration of mind, he had sufficient reason to know in this particular instance what he was doing, and that he was doing what was wrong, and he was convicted and executed. This occurred more than a century ago, and yet this formula then adopted, namely, did he know what he was doing and that he was doing what was wrong? has been substantially followed to this day.

In the case of Bellingham, who assassinated Mr. Percival, the Prime Minister of England, in 1812, the jury were directed in similar terms, and this man, although there was much to indicate a diseased mind, was also convicted and executed. Lord Mansfield, whose judicial reputation stands very high, said on another occasion that in order to support a defence on the ground of insanity it ought to be proved by the most distinct and unquestionable evidence that the prisoner was incapable of discriminating between right and wrong.

On the trial of Oxford for shooting at the Queen, Lord Denman told the jury that the question was whether, when the act was done, the prisoner was under the influence of a diseased mind so as really to be unconscious at the time that he was committing a crime.

In 1843, in consequence of the acquittal of one McNaughton for murder on the ground of insanity, certain questions were put by the House of Lords to the judges, and their answers to these questions have guided the judges ever since in their directions to juries on the subject of insanity, set up as a defence against punishment. From these answers one general principle may be deduced which is, that the bare existence of madness is not in itself an excuse for crime unless it so affects the conduct of the party on the occasion in question, as to show that one or more of the mental elements of crime, intention, will and knowledge of the legal character of the act were wanting.

These answers of the judges, which I think may be condensed into the formula I have mentioned, have been extensively criticised by eminent members of the medical profession. According to this formula, taken literally, it is said that a person may have had an extraordinary delusion, thus he may have conceived himself to be an angel or a fiend incarnate, and yet he may have been conscious that the act with which he was charged was wrong; and adopting the conclusion which the judges arrived at in its strictly literal sense, he would be responsible. Dr. Gressinger, who is considered I believe to have written upon this subject with much acuteness, says substantially, that a delusion of the kind suggested never, or hardly ever, stands alone, but is in all cases the result of a disease of the brain which interferes more or less with every function of the mind, which falsifies all the emotions, alters in an unaccountable way the natural weight of motives of conduct, weakens the will, and sometimes without giving the patient false impressions of external facts, so enfeebles every part of his mind that he sees and feels and acts with regard to real things as a sane man does with regard to what he supposes himself to see in a dream. But the answers of the judges seem to assume the man to be

insane in respect of his delusion only, and to be otherwise sane. I say assume, because the law assumes every man to be sane until his insanity is shown, and therefore outside of a particular insane delusion, sanity is presumed until the contrary is shown.

The conclusion arrived at by the judges seems to rest upon the mental capacity or incapacity of the person to understand the nature of the act, and to take no account of the condition of the mind beyond that particular. Now, if we apply this ruling to such a case as that of Hadfield, we shall see that it does not appear quite satisfactory. Hadfield imagined that he had constant intercourse with the Almighty, that the world was coming to a conclusion, and that like our Saviour, he was to sacrifice himself for its salvation, and in this state of mind he fired a loaded pistol at George III. in order to bring upon himself the punishment of death, and thus fulfil the sacrifice and avoid the guilt of suicide. Now here Hadfield clearly knew the nature of his act, and he knew it was high treason. He also knew that it was wrong in the sense of being forbidden by law, for the very object for which he did it was that he might be put to death so that the world might be saved, and his reluctance to commit suicide shows that he had moral sentiments. So that, tested by the conclusion arrived at by the judges Hadfield might have been convicted and executed. Such was not the case, and it will be found that whatever may be the literal signification of the directions given by judges to juries in these cases, they are generally so amplified in the minds of jurymen as to lead them to view the whole conduct of the man before making up their minds as to his insanity. A remarkable instance of the presence of an insane delusion, which would at first sight appear to have no connection with the act committed, is given by Mr. Justice Stephen. A man had an insane delusion about wind-mills, and would pass hours in watching them. His friends kept him out of the way of wind-mills in order to cure him of the delusion. He mutilated and nearly killed a little girl. But although there really was no apparent connection between the delusion and the act there was a connection in his mind. He thought if he committed a crime he might, as a punishment, be confined in some place where he could pass all his time in watching wind-mills, and as a fact he gained his object, for he was confined in such a place. All this goes to show that in considering whether a man has the necessary capacity to know that he is doing wrong, great care is necessary not to regard the act as being isolated from a delusion, although one is apparently foreign to the other. Yet it would never do to affirm that because a man has an insane delusion upon a particular topic, he must necessarily be excused from punishment for a crime. It is I think within the knowledge of every one who has thought upon this subject, that there are many persons who have extraordinary delusions, I may say insane delusions, upon certain subjects, who are held justly accountable for crime.

In a recent case in England one William Gouldsworth was tried and convicted for killing his entire family of children, consisting of five. The defence of insanity was set up, and the judge directed the jury to consider in the terms I have mentioned whether this man, at the time he committed the act, was disabled by mental disease from knowing the nature of the act, and that it was wrong. The defence was ignored, and the jury found him guilty, and he was sentenced to death. But the case was deemed a very important one, and Sir William Harcourt, the Home Secretary, had this man examined by two distinguished physicians after his conviction, and in consequence of their report his life has been spared, and he has been placed in confinement as being of unsound mind. It appears that this man, finding that his family was increased by the recent birth of twins, was possessed with the idea that the fate of the children would be misery, and this feeling working with supreme power on his mind, he killed all his children. The evidence showed that he had been a kind and indulgent parent, but of a moody, melancholy turn at intervals, and I suppose that facts of this kind were shown which the two medical men deemed sufficient to warrant their report, although at the trial there appeared to be no evidence of his disqualification to comprehend the nature of his act, and that it was wrong in the sense of being against the law. In the newspaper account of the transaction and trial to which I have referred, some comments were made respecting the judge's charge to the jury, to the effect that it did not go far enough in not directing the jury to consider whether the man did not commit the act while under the

influence of an uncontrollable impulse, springing from a diseased condition of the mind. It does not seem unreasonable to include the effect of an uncontrollable impulse of the kind as being within the meaning of a direction to consider whether the person was sufficiently sound of mind to know the nature of his act and that it was wrong; and had the jury thought fit so to construe the language of the judge, I do not see how any fault could have been found with their decision had they acquitted the man upon the ground of insanity.

Then, it may be said, why did not the judge tell the jury to consider whether the man, when he committed the act, was under an uncontrollable impulse springing from a diseased mind? The reason is the difficulty and danger there is in attempting to formulate this doctrine. Several theories on this subject of impulse have been heard of, especially in the neighbouring States, called by various names, such as emotional insanity, impulsive insanity, and so on. Now, the danger is that should the judge instruct the jury to acquit upon the ground of uncontrollable impulse, the door might be opened for an escape from punishment in cases where escape would be improper.

Another reason why the judge in the Goldsworth case did not go further in his charge and include this doctrine of uncontrollable impulse in his remarks is that it is not quite certain that this doctrine has been sufficiently established to make it a part of our law. Upon this point it is to be borne in mind that a single judge dealing with a subject such as insanity does not feel himself at liberty to depart from precedent. All the law relating to the event of insanity in criminal cases rests not upon any statute, but upon previous decisions of judges. Thus it is called judge-made law. But until some tribunal of an appellate kind authorizes it, single judges are extremely reluctant to authorize any extension of or departure from precedent.

When I say that this doctrine of uncontrollable impulse is of doubtful authority in our law, I only repeat what has been said by one certainly accomplished jurist. But, whether it is the law or not, I think there can be no doubt that, in the words of Mr. Justice Stephen, "No act is a crime if the person who does it is at the time when it is done prevented, either by defective mental power, or by any disease affecting his mind, from controlling his own conduct, unless the absence of the power of control has been produced by his own default."

It does not follow that because an impulse is insane it cannot be resisted. The following case, given by Mr. Justice Stephen from Dr. Gressinger's work will illustrate this: A woman felt suddenly and violently impelled to kill with a knife the child she was nursing. She threw away the knife, rushed out of the room, and asked a fellow servant to sit with her because she was "beset with evil thoughts." She woke in the night with a similar impulse, but resisted it, saying, "Oh, God, what horrible—what frightful thoughts. This is ridiculous, abominable, terrific." She took some medicine and became calmer. On another occasion the same thing happened, but she still resisted, and took proper medicine. Ultimately this desire to harm the child died away. Now there can be little doubt that this impulse was insane, but it was capable of being resisted, and was successfully resisted.

I am inclined to the opinion that practically the present condition of the law is not so faulty as some persons think. It seems to me that when a judge instructs the jury that the person is responsible for his act if when he committed that act he was mentally capable of understanding the nature of the act, and knew that the act was wrong, this direction comprises the effect of uncontrollable impulses arising from mental disease. The judge's duty is to state to the jury what condition of mind is requisite for responsibility. That is a legal question. But the province of medical men is clear, I think—namely, to state to the Court from their experience what effect the symptoms and exhibitions of conduct shown would be likely to have upon the elements of responsibility announced by the judge.

Several years since a writer in the London *Times* said: "Nothing can be more slightly defined than the line of demarcation between sanity and insanity. Physicians and lawyers have vexed themselves with attempts at definition in cases where definition is impossible. There has never yet been given to the world anything in the shape of a formula upon this subject which may not be torn to shreds in five minutes by any ordinary

logician. Make the definition too narrow, it becomes meaningless; make it too wide, and the whole human race are involved in a drag net. In strictness we are all mad when we give way to passion, to prejudice, to vice, to vanity. But if all the passionate, prejudiced, vicious and vain people in the world are to be locked up as lunatics, who is to keep the key of the asylum? As was very fairly said by a learned Baron of the Exchequer, when he was pressed by this argument, if we are all mad, being all madmen, we must do the best we can under such untoward circumstances."

It is the peculiar province of the Court of Chancery to deal with cases involving fraud, and yet it is well known among lawyers that this Court has always abstained from attempting to define in specific terms what constitutes fraud. The Court waits until the facts of each case are known, and then pronounces whether, from these facts, fraud is established. But to set forth a formula which would include all the varieties of fraud has certainly not hitherto been done, nor probably will ever be done. Just so with insanity. Each case will have to be judged from the facts presented. Members of the professions of law and medicine will, I think, upon reflection perceive that mutual forbearance and respect are desirable in treating this subject.

A correspondent in the *Times* of Oct. 25, 1883, says: "Our special ground of complaint and remonstrance is that a palpable error made some forty years ago is perpetuated and acted upon in the total disregard of the truth established, beyond all question, in the minds of every member of the medical profession who has any charge of the insane. This error having been established as the law governing these cases, the judges refuse to admit the plea of insanity unless it can be shown that the accused did not know the difference between right and wrong, which, as a matter of fact, is no test at all, many insane persons considering that right which the world would consider wrong, and many others deliberately doing what they know to be wrong with some irrational object."

I do not say that the test which it is usual for judges to apply to cases in which insanity is set up as an excuse for crime is perfect. That test, as we have seen, is: "Had the person, when he committed the act, sufficient mental capacity to know what he was doing, and that what he was doing was wrong?" This is the usual direction given by a judge to the jury in cases of alleged insanity. Much has been said about the insufficiency of this direction. Still I believe it will be found, upon trial, that it is not easy to substitute for this direction another which will not be open to objection. Probably this direction might go further, so as to express to the jury that if they are satisfied the act was done while the party was under the influence of an uncontrollable impulse arising from a diseased mind, they should acquit. And it is not certain that such a direction is without the authority of precedent. Still, judges do seem, as I have said, to hesitate to amplify their directions by the addition of this language about uncontrollable impulse. They do so apparently through apprehension, that the jury may regard any act done under the influence of violent passion as proceeding from that cause. The law clearly recognizes the distinction between homicide committed after deliberation and the homicide committed without premeditation under the impulse of passion. The effect of this distinction is to make the homicide manslaughter instead of murder, and thus to mitigate the punishment—not to excuse the party from all punishment. When I say *all punishment*, it is to be borne in mind that a party acquitted on the ground of insanity is subjected to confinement, it may be for life; but this is not imposed by way of punishment, but as a necessary restraint. I think it will scarcely be a matter of surprise that judges should hesitate to overstep the limit which precedent has hitherto established with certainty, when we consider what wild theories have been advanced to the effect that all crime, especially homicide, is committed by persons whose minds are diseased. When the jury are told to consider whether the person had mental capacity to know the nature of the act, what does that direction include? It includes the consideration of the individual's every-day life, his conduct in his private and public relations, his delusions, his idiosyncracies. It means that the jury are to consider whether, from the nature of the evidence adduced, taking the range of the individual's past career, and the medical evidence, they can say that the man, by reason of mental disease, was incapable of controlling his own conduct. If he is not capable, then he is not responsible for his acts. Thus, in coming to a conclusion, proof of any insane delusion or impulse is relevant to the

question whether he could or could not control his act, although these exhibitions of conduct may appear unconnected with the fact in question. In these inquiries the opinions of skilled medical men are valuable to show whether, from their experience, these indications are symptomatic of a mind so diseased as to constitute the conditions laid down by the judge to indicate insanity.

This may appear a rough and ready way of disposing of a question which many regard as involving intricate psychological inquiries. Nor is it likely to be satisfactory to the profound medical student, who perceives that it involves nice discrimination as to the delicate organisms and structures of the brain.

But it may help to reconcile us all to this practical, and perhaps this imperfect mode of administering justice in relation to insanity, when we reflect how imperfectly in the tribunals of this world we mete out justice to criminals in cases where insanity does not come into question. Here, for instance, is a miserable wretch for whom there never was the inestimable advantage of early training; to whom no pious, loving mother ever imparted by tuition or example those early lessons of virtue and morality which are more potent to regulate the future life than any subsequent influence; to such a person the haunts of vice have probably been as familiar as the church and Sunday school and wholesome parental control have been to him whose lot has been cast under happier auspices. Take temptation away, says Thackeray, and which of us is better than his neighbour? Yet grinding poverty, temptation, evil associations—all these, with blunted sensibilities, furnish no shield against punishment. Oh! says the practical man of the world, it cannot be otherwise. Society must be protected against crime. They cannot in courts measure criminal delinquency by a finely graduated scale. Unhappily this is true, and the reflection may help to reconcile us to what may appear an imperfect mode of dealing with insanity in respect to criminal responsibility.

The London Flood and Its Results.

(By Dr. Waugh.)

During the evening of the 10th day of July last London and vicinity were visited by one of the heaviest rainfalls ever known, extending over an area twenty miles wide by fifty in length. The amount of rainfall in London was a little over three inches between 6 p.m. and 2 a.m.—some localities to the north and south report a rainfall of four and a-half inches. This area includes a section of country drained by the two branches of the river Thames, which run to the north and south of the city, and unite to the west thereof. In consequence of the utter inability of the ordinary channels to convey away this immense quantity of water, all the low lands in the north and south of the city were flooded, and the village of London West was submerged. The flood only lasted a few hours, but when the water subsided there were 314 houses in Kensington and over 80 along the banks of the river which were rendered for the time uninhabitable. The entire flooded district was covered by a thick tenacious deposit of a most disagreeable smell. The question is: Where did this immense quantity of filth come from? Part, no doubt, had accumulated in those localities, as no sanitary arrangements had ever been carried out in them; part may have been deposited in the several mill-dams in and above these places, but it seems strange that such a large amount of filth could have collected in or near the city without attracting attention. The problem for the Sanitary Committee in London was: What means were the best for them to take to make these 400 houses habitable and prevent an outbreak of disease? In fact, from the wretched condition of the places, it was debated for some time whether it would not be better for the Committee to take severe measures, and prevent the inhabitants from returning to their homes for at least a month, while means would be taken by them to improve these houses, and remove as much of the filth as possible. But there were several difficulties in following out this plan—many owned their homes and did not wish to leave them, and it would be impossible to find houses for them all in other parts of

the city. It was decided that although these people might run some risk in staying, the work was likely to be more quickly and thoroughly done by them than by the Committee alone; any delay would cause a considerable growth of vegetable matter and increase the difficulties. It was at last decided that the Committee would give all the assistance they could to improve the sanitary condition, to those who had to occupy these houses. The first thing was to get a water supply. As the village had only wells to depend on, the city at once ran pipes from their waterworks, and gave a full and free supply for some time. Thus one difficulty was easily overcome, which, under different circumstances, would have been very serious, as there was not a well in the village fit for use. The Sanitary Committee, acting with the Relief Committee, had at once made arrangements to have the work done as quickly as possible. Several large pools of stagnant water which remained were drained, and tile put in, making a permanent improvement, and the surfaces thickly covered with chloride of lime. All the refuse matter and rubbish was collected into heaps, covered with tar and burned; the dense smoke from the burning tar may have had some effect in purifying the atmosphere, and may have lessened somewhat the fearful stench from the place. It was decided to divide the district into localities, and each of the city physicians was requested to superintend the work, and see that it was properly done. Chloride of lime and lime were freely distributed. The deposit on the streets was collected in piles, disinfected, and removed, the grounds around the houses were raked over and sprinkled with lime, the refuse from the houses was removed as quickly as possible, the floors thoroughly washed, and fires kept going to dry the houses as soon as could be done. Quicklime was thrown in some of the wells to deposit the organic matter, and after pumping out, the bottoms were cleaned; the cellars were pumped out, and all the refuse removed and disinfected, and their walls and ceilings and floors washed with lime. In this way a week made a great change in the place, the disagreeable odour from the deposit was materially decreased, and many of the houses were fairly habitable. The advantages of the course taken by the Committee were, I think, these: By dividing the district into localities the physician could make an inspection of each house, and see that the work was thoroughly done. It was considered, from the previous condition of many of these cellars, that they would be left, in some cases at least, in a very unsatisfactory condition, although the upper compartments were thoroughly cleaned; they therefore advised the Relief Committee to grant to each occupier of a house the sum of $5, on the certificate of the inspector in the district that the work had been thoroughly done, and no doubt many cellars were well cleaned last July that had never been cleaned before. The free supply of lime and chloride of lime as disinfectants materially assisted in preventing an outbreak of disease. I think it was the experience of every physician who took part in the work that the people were willing and anxious to use every means they could to get their dwellings into a good sanitary condition as quickly as possible, and any suggestions made by the inspecting physicians were, if possible, at once carried out. For the first week or two after the flood there were a few cases of diarrhœa, chills, and some increase in nervous affections, but not nearly as much as was expected. All the means I have mentioned were carried out as vigorously as possible, and within a month the sanitary condition of the flooded district was at least equal to what it was before the flood. Such were the means taken to prevent an outbreak of disease following the London flood, and the result is one which is very satisfactory to all who assisted in carrying out these means. All the physicians I have been able to see give the same opinion: That there has been less sickness in London West this summer and autumn than usual, and that its present sanitary condition is better than it has been for years back. And there might be another result. If, under such exceptional circumstances, the carrying out of simple sanitary rules was sufficient to prevent an outbreak of disease and improve the sanitary condition of this district, the Committee that arranged the plan of work and saw it carried out might feel inclined to extend their operations to the city, where much of the same kind of work has to be done every year, but is done in a very different way. The only way the work could be done in this case was by having some systematic plan to go by, and following it out as quickly as possible; and, although the work looked very formidable for the first

few days, steady perseverance soon showed such improvement as made the outlook very hopeful for those engaged in it.

There are many of the duties our Board of Health are expected to perform very much the same as in this exceptional case, and if the Committee could induce them to drop the dilatory way they have carried on in the past, and adopt their plan of doing business, some system to guide them, and throw some energy into carrying it out, the city would be improved as much proportionately as the flooded district. If, instead of our Board of Health publishing a general order in the spring for the citizens to clean up their premises and remove all refuse material, and then doing nothing further until from some localities complaints are made to the health officer, some plan could be devised to see that the work was properly done and interest each one in carrying it out, it would be a great advantage; and if, instead of leaving our sewers during the hot summer months, until the smell becomes so intolerable that action has to be taken, some regular means were taken to have them flushed at stated intervals and kept free from all decomposing matter, it would be a decided improvement; and if, instead of allowing refuse matter to be deposited on vacant lots about the city, until the neighbourhood can stand it no longer, means were taken to have it removed away from the limits and thoroughly disinfected, it would improve the public health. These and other important improvements, such as the removal of refuse material, can only be effected by doing as was done in London West, arranging some systematic plan for the work, and seeing that the plan is followed out; and if our local Sanitary Committee, from the experience they had last July, can do this, some good will result from the London West flood. In all our cities, towns, and villages there are large quantities of refuse matter, partly covered by the soil and protected from rains, undergoing slow decomposition, the gases retained in the soil until carried off by rains or passing off into the atmosphere to poison it, and only attracting attention when, after a hot period, decomposition goes on a little more rapidly than usual. In the flooded district this refuse matter, the collection of years, was brought to the surface by the action of the flood and placed under the most favourable circumstances for rapid decomposition—heat and moisture. Part of the deposit may have been carried some distance, and settled here, as, on account of the narrow channel at the railway bridge, the water was dammed back for some time, and there would be more deposit to the west of the city; but there is, no doubt, a considerable amount, at least, that had collected in the village in years past. Hence, the result of the London West flood was this: This refuse matter, instead of slowly decaying through the hot summer months, under different circumstances, was very rapidly decomposed, and became so offensive that it was absolutely necessary to have it removed as quickly as possible, and after that had been thoroughly done the place was left in a cleaner condition than it had been for years back, and with the usual result, there was less sickness in those places since than usual. But I suppose things will now go on in the old way, refuse material will gradually accumulate, each year becoming worse, until another flood does good by washing out the place.

The Province of Sanitary Journalism.

(By John K. Allen, Associate Editor of The Sanitary News, of Chicago.)

This subject may not, at first, seem to be of any interest to such a gathering of people as are present in this Sanitary Convention. But, as this meeting may very properly undertake to discuss any subject bearing upon the promotion of the public health, and as sanitary journalism has this as its sole aim, the subject will be appropriate.

One of the first questions which would arise to a person asked to interest himself in a sanitary journal, might be: Is there a demand for it? I answer, that for a certain kind of sanitary journalism, there *is* a demand. There have been several sanitary periodicals started on this continent, which have succeeded only in numbering a few issues, having to give up the struggle for lack of support. But the number of successes outnumbers the failures. The field in this country, and the United States as well, is pretty

well occupied at present, but the demand for such literature is increasing constantly, and it is only a question of time, when well-managed papers will accumulate large revenues, and new papers will be established. There is danger that unscrupulous and uninformed persons will attempt to line their pockets by use of the magic words "sanitary science," and bring the whole effort into bad repute with the general public. To counteract this possible effect, true sanitarians must do all in their power to elevate the dignity of this humanitarian science.

Having established the sanitary paper, the next point to determine is its scope. On this rock the enterprise will either split, or it will ride over in safety. It is a point to be decided largely by the character of the majority of the subscribers to the paper. If a sanitary paper circulates mostly among physicians, its literature should be of a sanitary-medical character; if among architects or plumbers, the contents would very properly relate to the sanitary construction of houses; if among the general reading public, the contents should cover the whole field of sanitary science. Articles of a medical or other character not bearing strictly on sanitation should be excluded.

The legitimate field into which a paper must look for its subscribers is also of considerable moment. A general sanitary paper could, with propriety, ask for subscriptions from doctors, lawyers, clergymen, teachers, architects, civil engineers, health authorities, plumbers, builders, etc., as well as the few advanced individuals belonging to the general public. Every man who owns a house, or intends to build, is interested, and should study the project from a sanitary standpoint.

The State and Provincial Boards of Health, if they are at all active, take away from the sanitary press a great deal of labor in educating the people at large. It might seem as if they deprived the sanitary press of a large amount of business, by the free distribution of public health documents, but I am inclined to believe that this stimulates a desire for sanitary reading which leads to subscriptions to some sanitary periodicals.

I have heard the complaint that sanitary essays and articles have failed, in the majority of cases, to reach the masses for whom they were intended. This is undoubtedly true. The people who most need to read about and to practise sanitation, are the very ones who will not pay for such instruction. Our system of sanitary education begins at the top, and it is almost necessarily so. The people who are well-informed, habitual readers, and wealthy withal, are the ones who profit by sanitary instruction first, and the poorer and more ignorant must either learn by precept or example. The only remedy for this condition of affairs, is to have hygiene taught in our public schools, running through a complete graded course from a primer to a scientific treatise.

It is probable that a sanitary journal which expects to receive its support from the general public will fail, as I believe it necessary, at the present time, to interest one or more trades or professions.

The people who should support sanitary literature are very numerous; but those who will support it are not so plentiful. From the natures of their callings, and as representative men of the localities in which they live, the preachers, doctors and lawyers, are under implied obligations to support public health movements. As a matter of fact, they do not do it. Any follower of a trade, which has in the slightest degree any relation to the health of the workman or his employer, is under obligations so to inform himself that he can perform his work without danger to his own health, or the health of those who shall use or occupy the product of his labor. The tradesmen at present patronize sanitary periodicals more freely than the professional men.

The sanitarian fondly hopes that some day the profession of medicine will experience a change in its practice, and that its character will then be preventive rather than administrative. This result will come gradually; even now, observers can detect a change in the medical journals of the land. Instead of adhering strictly to literature relating to the curative art, they pay more or less attention to preventive medicine and hygienic literature. Very frequently I have had my nerve-center of felicity vibrated by the appearance of some of what I, at least, would concede to be my best efforts, snugly ensconced in the columns of a medical journal. The most inconsistent exchange which comes to my table, is a journal devoted to the interests of the drug trade, which appropriates each week more or less matter relating to public health, from the journal with

which I am connected. (It is needless to say that he gives no credit; the editor is anticipating the *effect*, by appropriating credit for a small portion of the *cause*.) Medical and drug journals are great trespassers upon sanitary literature, but if such trespass is improper, it is necessary that the medical journals should metamorphose into sanitary journals sooner or later, and they are gradually accomplishing this instance of evolution.

What has the sanitary press attained? It has accomplished the conversion of a large class of tradesmen from ordinary plumbers into sanitary plumbers; it has created a new profession—that of sanitary engineering; it has induced architects to change their work from a merely artistic to a sanitary character; it has proved a ready means of communication and interchange of sanitary views, thus evolving the best; it has been a constant disseminator of sanitary intelligence between countries, states and provinces.

Those of us who are engaged in the dissemination of sanitary information, have a most delightful expectation before us. As our labor bears fruit, we may see in our mind's eye the more thorough enjoyment of life taken by our readers, in improved dwellings, free from foul air, dampness and sewer emanations. The increased longevity of the race, the greater amount of felicity experienced by those who do live, and the improved construction of habitations, we reasonably expect as the legitimate results of our journalistic work.

Our rewards for our work, other than the pecuniary remuneration attending well-regulated business ventures, are the pleasant thoughts that illumine the lives of sanitarians and all other humanitarians, who labour for the amelioration of the condition of the human race.

Malaria.

(By J. G. Bray, M.D., Chatham, Ex-President Ontario Medical Council.)

I have chosen for this paper the subject of Malaria for two reasons:—Firstly, because it is the source of most of the sickness in Chatham and vicinity; and secondly, because it is a matter that should be brought prominently before the people and the Government, for the purpose, if possible, that some means may be devised to reduce the supply and check its spread.

There are three things necessary for the production of Malaria, viz.: heat, moisture and vegetable decomposition; and just in proportion as these exist will the character of the miasmatic poison be, and the influence it exerts on the system manifested. Unless these three causes combine, we can have no Malaria. We may have vegetable decomposition going slowly on at a comparatively low temperature, producing a small quantity of miasma, but not in sufficient quantities to cause intermittents; but should the thermometer rise to, say, 80°, and remain at that point for a week, ten chances to one several cases of intermittent fever will occur. Should the temperature become still higher, and continue so for any length of time, the intermittent will be replaced by remittent and continued fevers.

My experience in a malarious district has extended over a period of twenty years, and during that time I have been a close observer of the changes that have occurred in the character of the fevers that are endemic to this section, as well as the climatic influences which affect the character of this poison. Shaking ague was almost the only form of Malaria existing in the County of Kent twenty or thirty years ago. Now, such a thing as a genuine old-fashioned attack of shaking ague is almost unknown, particularly amongst old residents and those acclimated to the country. The exceptional cases that do occur are in the persons of immigrants.

There are several things which exert a modifying influence on the production and spread of Malaria. Among which are time of year, rainfall, freshets, lakes and rivers, the winds, and, above all, drainage.

1st, Time of year and rainfall. As an example: suppose we have a wet spring with high water in the streams which overflow the country for a considerable extent. With a low temperature there will be no Malaria, but as soon as the water dries up and evaporates an occasional case of chill and fever occurs, but if rain again falls and the low spots

become covered with water this disappears, and we are free from miasma, and will remain so until they again become dry and the temperature rises, when decomposition begins, and as a consequence Malaria is germinated in great quantities which is absorbed by plants, water, the earth and human beings, producing intermittent, remittent, bilious and continued fevers, diarrhœa and dysentery.

The year 1881 was the most unhealthy one I ever knew in this county, and the mortality the highest ever experienced. The spring of that year was a very wet one, followed by an exceedingly hot and dry summer and autumn, the temperature ranging for six or eight weeks from 80 to 100 degrees in the shade, without a drop of rain. As a consequence the wells, which are all surface ones, became low and eventually dry; and, as all the water was impregnated with Malaria, it followed that, as this water got scarce, the Malaria became more concentrated, and as a consequence more poisonous; and to make matters worse in one or two townships water had to be carted in old barrels from rivers and streams that have no current and emptied into these wells or holes that are never cleaned. And this stuff was consumed in large quantities by farmers and their families without even being boiled. And can you wonder that Malaria is some form or other took possession of nearly every house when this state of things prevailed, and the remedy only came when the rains of fall appeared and the poison became diluted?

Now, in marked contrast to the year 1881 were those of '82 and '83, the springs and summers of which have been remarkably cool and wet. Rain has fallen every day or two, keeping the lowlands submerged, and the temperature has never been higher than 80 degrees, and then only for two or three days at a time; and, as a consequence, there has been but little decomposition and scarcely any Malaria.

I have said that season and rainfall have a modifying influence on the production of Malaria, and have in a feeble way endeavoured to show how they do this. But as it is not within the scope of human power to control the rainfall or the temperature, it follows we cannot prevent altogether the production of Malaria.

But I will now endeavour to show how it is within our power to lessen its spread. As before stated, drainage possesses one of the most powerful influences over the production and spread of this poison. It is well known to many present that portions of the Raleigh Plains in the County of Kent, that a few years ago were partly or wholly covered by water, untillable, and almost valueless, were one of the great reservoirs for malaria, but are to-day almost free from it, and, what is more, are now among the best of our farming lands, yielding crops of corn and other grains which cannot be surpassed in this or any other country, and are worth from $50 to $75 per acre, when fifteen years ago they were not worth fifty cents. This wonderful change has been brought about by the construction of five or six large drains, and I am happy to say that at this moment there is a dredge working on the plains, also a new wheel, devised by Mr. Pike, which will drain nearly the whole of this large waste of—I was going to say land, but it would be nearer the mark to say rushes and water—and make it, as part has already been made, the homes of first-class farmers, and when this has been accomplished one great source of Malaria will have been removed, and the public health materially benefited. I think that no government could employ the funds at its disposal to better purpose than the improvement of the country and the health of its inhabitants. And I would suggest that some of our surplus be expended in the planting of forests, the drainage of low lands, the sinking of artesian wells, and in any other way whereby the spread of Malaria can be prevented.

One, and I think the chief, reason why Malaria, instead of being confined to a few localities, as was the case thirty or forty years ago in this Province, is now almost universal, is because the forests have been cut down, and the country cleared up and cultivated, thus allowing the winds to carry the poison for miles to homes of those living in districts where Malaria was formerly unknown.

I have often asked myself the question: Why do we have Malaria in winter if the theory be correct that a lower temperature destroys it? And the only solution that I can give is that the three great receptacles before named, viz.: the earth, water, and the human system, have a supply in store, which, under favourable circumstances, produces its effects in the shape of intermittent or other fevers. The water in the wells being

impregnated with it is one great source of supply, particularly when the ground is frozen for a long time and the water gets low.

The second reason is that from under houses and protected spots it escapes.

Thirdly, some people have a continual supply in their systems, only waiting to develop itself when it finds a good opportunity for so doing, as when a person is exhausted by over-fatigue or loss of rest, or otherwise runs down. In fact, in this part of the country, it is a factor in most diseases, as is proved by the beneficial effect which quinine produces over almost any affection. 'Tis true the type of fever is milder in winter, and for the reason that the sources of miasma are limited in comparison to the summer, and are confined to localities where Malaria is epidemic, as I think is proved by the reports of the Ontario Board of Health. In other words, there is not enough Malaria generated for the winds to carry it to any distance in sufficient quantities to produce its physiological effects, if, indeed, it could survive owing to the frosts it would have to encounter on its way.

Now, if this theory is correct as to why we have Malaria in winter, then is there any remedy, and if so, what is it?

1st. I would advise good ventilation in and under our houses. Do not bank them up with earth, as is the general custom in rural districts, or close the ventilators, as is often done in towns and cities, but have double floors with a layer of felt paper between.

2nd. For towns and cities have water-works, and bring the supplies from springs, rivers or lakes that are not impregnated with Malaria; and in the country sink artesian wells and do away with the miserable surface holes that are to be found all through the western district.

In conclusion allow me to summarize:—(1) Heat, moisture, and vegetable decomposition are necessary to produce Malaria; (2) season and rainfall exert a great influence on its production; (3) the earth, forests, water, and people absorb it; (4) in small quantities it produces intermittents, in a more concentrated form remittents, diarrhœa, dysentery; (5) winds carry it to long distances; (6) drainage prevents its formation; (7) forests prevent its spread. I would most earnestly urge both the people and Government of Ontario to study the subject of public health, and to use every means at their command to improve the sanitary condition of the Province and prevent the spread of Malaria by drainage, the erection of water-works, the sinking of artesian wells (particularly for the use of public schools), the planting of forests around the principal sources of this poison which cannot be drained, and by the appointment of Boards of Health, not only in towns and cities, but in villages and townships, one member of which should be paid a salary by the municipality, whose duty it should be to inspect school houses and their surroundings, and to see that all necessary steps be taken, not only to check the spread of Malaria, but that of other poisons also.

Principles Underlying Every Comprehensive System of Sewerage.

(By Professor J. Galbraith, M.A., School of Practical Science, Toronto, Ont.)

As a town increases in population and extent, the question of the proper disposal of sewage is forced upon the consideration of the civic authorities, and it becomes necessary to devise arrangements for effecting this object which will be at the same time effective and suited to the financial conditions of the municipality.

The object of this paper is to lay before you some of the principles which experience has shown to underlie efficient systems of sewage disposal, and also to indicate some of the various methods which have proved effective under different circumstances. In the early portion of a town's existence, while it is yet but a country village, little or no attention is given by the authorities to this matter; individual action alone is relied upon. As a consequence nuisances accumulate, which are found afterwards to be difficult to remove or keep within proper bounds. As the place grows, attention is naturally first directed to the streets. These are graded, and gutters constructed to carry off the surface water,

kitchen slops and offal are thrown into the streets to be carried off by occasional rainstorms; soon the lower ground is built upon and it becomes necessary to drain cellars; underdrains of rough stone, or it may be of wood, are now constructed, leading to neighboring water-courses or lower ground; with these the street gutters are connected. If the town still further increases in size and importance the underdrains are extended upwards without increasing the capacity of the portions first built; houses are connected with them by wooden box-drains or open-jointed tile pipes, and additional drains are built in other portions of the town, with little or no reference to those first constructed. Some enterprising individual, struck with the filthiness of his privy, now builds a cess-pit, and connects it with a public drain. Others who are able to afford it follow his example, and soon the drains, intended originally to carry water only, become receptacles of filth of the worst description.

Perhaps now the question of water-works is agitated. Public meetings are held, the conveniences and advantages arising from a bountiful supply of pure water in every house are painted in glowing colours; by-laws are passed, and the works are constructed; water-closets and sinks are introduced into the houses, connections made with existing drains, more drains are built, and every one is convinced that the town at last is as well equipped in respect of water and drainage as any well-conducted town could reasonably expect to be. Things take their course for a year or so without anything occurring worthy of special notice; bad smells are occasionally noticed in cellars or from drains when opened to make new connections or extensions; the subsoil appears a little damper than might be desirable; but these things come to be looked upon as matters of course, and of no moment. Some old-fashioned people have suspicions that the place is not as healthy as in the days before all these new-fangled notions were introduced, but they are pooh-poohed by the younger generation, to whose enterprise the innovations are due—and so things go on. It may happen that nothing of special importance seems to disturb the general serenity. It may also happen that a case of typhoid fever or diphtheria, or some other of these catching diseases, is introduced into the community, no one knows how. However, very soon every one knows that it is there, for it rapidly spreads and, perhaps, passing over the poorer portion of the town, where there are no drains and where the people drink well water, it spreads among the most respectable people, people who live in houses fitted with every convenience for health and comfort. After a few visitations of this kind, very possibly there is an outcry against systems of sewerage; they are voted a delusion and a snare, and a return to the former system, or rather no system, is advocated. But this is found impossible; the water-works are there, and seem as if they intended to stay; so finally attention is directed to the drainage system. It does not now require very much common sense to understand that rough, badly-constructed drains which leak at every joint are not the best carriers of sewage, or that the immense quantity of water thrown into them by the water-works has not tended to keep the ground sweet and dry. Public attention once thoroughly awakened to the fact that all is not well with the drains, steps are taken to remedy the existing evils. A competent engineer is engaged to arrange a general system of sewerage, and to devise measures for carrying it out with a due regard, among other things, to the drains thus to be made on the municipal purse. A system of water-works necessitates a system of sewerage, as surely as a system of contracting debts necessitates a system of paying them—failure in either case leads to demoralization.

A system of sewerage in connection with water-works is known as the Water-carriage system, and the following are some of its prominent features:—It must have a proper outlet. The sewage being greatly diluted with water, is practically useless as a fertilizer, and must therefore be wasted. It must also be disposed of in such a way as not to be prejudicial to the health of the neighbouring municipalities. It is generally thrown into large bodies of water, such as the sea, our great inland lakes and larger rivers—where this cannot be done, ways must be devised suited to the local circumstances in each case. One fairly satisfactory method is to dispose of it by what is called "intermittent downward filtration," whereby it is distributed over several acres of waste land, which must be underdrained several feet below the surface, if not of a porous nature; this distribution is made in such a manner as to prevent the soil from being permanently filled with

decayed organic matter; and the water passes from the underdrains sufficiently pure not to pollute the neighboring streams into which it runs.

In the Water-carriage system the sewers must be perfectly water-tight, and with smooth inside surfaces. The sizes, shapes and inclinations must be such that the average flow is deep enough and fast enongh to carry along all solid sewage, so as to prevent, as much as possible, putrefaction from taking place within the sewer, and the consequent evolution of the so-called sewer gas, which is nothing more or less than common air mixed with the gases arising from putrefaction. The sewers should be well ventilated, in order that the sewer gas may be as much as possible diluted with air. Their connections with each other and with house drains should be arranged so as to prevent the formation of eddies, and the consequent deposition of solid matter; man-holes and lamp-holes should be provided for the purpose of discovering and removing accidental obstructions. The foundations should be solid to prevent the settling and breaking of the tubes; means should be provided for flushing them whenever it may be considered necessary. Below the sewer a parallel line of open-jointed drain pipe should be laid if the ground is naturally wet; this drains the subsoil and solidifies the foundation of the sewer. The larger sizes of sewer should be built of hard brick laid in cement mortar, and the smaller may consist of vitrified earthenware pipe with cement joints. An important factor in determining the sizes and inclinations of sewers is the amount of rainfall on surfaces drained by them; of course this comes into consideration only where there is connection with the street surface by means of gullies. It is usually the practice to make such connections where the Water-carriage system is used. Where it would be found expensive, or for other reasons inexpedient, to provide for carrying the whole rainfall in sudden storms through the whole system of sewerage, arrangements can be made in many instances for discharging the extra amount at higher levels than the usual outlet of the system. Street gullies must be so constructed as to prevent the entrance of mud, stones, etc., into the sewer.

The above are some of the principal considerations in the construction of a system of sewerage. It is almost unnecessary to remark that no system can be considered well devised which does not take into consideration the probable future increase of the town in population and extent.

We will now suppose the new sewerage system in our town to be completed in accordance with the most approved ideas, and the inhabitants congratulating themselves upon the fact that although the taxes are rather heavy, they have something to show for their outlay. A heavy snow-storm takes place during the night; next morning a respectable ratepayer on rising notices a peculiar heavy smell pervading the house; he thinks that perhaps something is the matter with the self-feeding coal stove; on examining it, however, nothing seems to be wrong; he continues his investigations and finds the smell unusually strong in the bath-room. Something clearly is wrong with the plumbing; sewer gas is evidently escaping; nothing of this kind has ever occurred before, and it puzzles him to account for it. We shall endeavor to solve the mystery. The plumbing in this house is similar to that in nine-tenths of the city houses throughout the Dominion; a soil pipe runs from the water-closet to the basement, where it is connected with the drain which runs to the sewer. There is a trap in this drain which is supposed to prevent the flow of sewer gas into the house; there is also a trap at the water-closet which is intended to prevent the foul air between it and the trap in the house drain from entering the bath-room. The heavy snow-storm has temporarily stopped up the gratings in the streets by which the sewer is usually ventilated; an increase of pressure within the sewer has taken place, caused perhaps by wind blowing into it at its outlet; the gases in the sewer cannot escape by the street gratings, and so are forced through the traps between the sewer and the water-closet, into the bath-room. What is the remedy for this state of affairs? Nothing is more simple, yet on account of the additional expense it is rarely applied by builders. The soil pipe, instead of ending at the water-closet, should be carried up past it through the roof and communicate with the open air. If this had been done the gas forced past the trap in the house drain would simply have passed through the soil pipe to the roof, and not have been forced through the water-closet trap into the rooms.

Perhaps the householder is of an investigating turn of mind, and some day when he

has nothing better to do, annoys the lady members of his family by poking into the kitchen, or going down into the cellar. He begins to nose about, and is struck by the dampness of the walls, and the generally unwholesome smell of the place ; he feels certain that the open-jointed subsoil drains cannot be in good working order, and yet he has had these drains put in under his own supervision and connected with the trap of the house drain, in order to prevent the reflux of gas from the sewer. The cause of the unpleasantness is probably this : In order to ensure against the premature choking up of the house drain by broken crockery, tumblers, knives and forks, rags, etc., the builder has taken the precaution to make it of 6-inch or 9-inch piping ; and to save expense in digging, it has been laid level, or nearly so, from the house to the sewer, where it suddenly takes a downward dip. What is the result of this? The water thrown down the soil pipe trickles in a flat, shallow stream along the bottom of the drain with neither velocity nor depth enough to carry off the solid sewage, which consequently sticks to the pipe ; after a while the pipe becomes nearly full of semi-solid filth, the trap itself becomes choked, and an overflow takes place into the open-jointed subsoil drain, permeating the cellar soil with the sewage. The remedy is plain. The immense house drain should immediately be taken up and replaced by a four-inch pipe laid with a gradual inclination from the trap to the sewer. Four inches is large enough for the drain of any ordinary dwelling-house, and means must be taken to prevent the entry into it of anything but sewage. The subsoil drain, again, should not be connected with the trap, there being better methods of effecting the object, which, however, would take up too much space to describe here.

I have selected the foregoing examples to illustrate a few of the prominent faults of cheap plumbing and house drainage. It would require a volume to exhaust the subject. In some of the larger cities of the continent the evils arising from this source have become so great that the authorities have been forced to take the matter into their own hands; but in the great majority of towns this department of sanitation is left to individual responsibility. From the above it will be apparent that it is just as important to have the house plumbing properly done as to have a good system of street sewerage.

Where there are no water-works, what is known as the *dry system* of sewage removal is employed. This system is very fully explained in a pamphlet issued a few months ago by the Provincial Board of Health, to which I would refer those of you who feel interested in this subject. However, a general explanation of the system may not be out of place here. The prominent points are as follows : The solid portion of the sewage is kept separate from the liquid portion. No fæcal matter or solid kitchen refuse, or in fact solid refuse of any kind, is allowed to enter the sewers, which are much smaller and built with steeper inclinations than the sewers of the Water-carriage system. Again, it is not usual in this system to connect the street surface with the sewers, since the smallness of the latter renders them peculiarly liable to be choked by stones, sticks, etc. They are intended to carry only kitchen and bed-room slops, and such liquid refuse from factories, etc., as does not contain matter liable to solidify. Most of the provisions described above as applied in the construction of the Water-carriage system, must also be applied in this system. Since the sewage is of a concentrated nature, special provision must be made for frequent flushing, and also for ventilation. Dry earth, or ash closets, or some of the pail closet systems for the disposal of fæcal matter form a part of the dry system of sewage removal. Owing to the concentrated nature of both the solid and liquid portions of the sewage, it has been found practicable to use them as fertilizers, and in fact what are known as sewage farms have been successfully established where this system is in vogue.

In conclusion I may call your attention to the fact that, in spite of bad plumbing, bad sewerage, bad water, and bad air, we still manage to drag on a miserable existence, when, according to the best sanitary authorities, we ought to have given up the ghost long ago. Perhaps the lesson to be drawn from this is that we need not be in too great a hurry to spend money by adopting all the latest sanitary novelties ; *go slow* is a good motto sometimes, and time spent in giving a scheme of improvement thorough consideration is well spent, provided always that it is followed by energetic and persevering action.

"Sewerage and Disposal of Sewage."

(By Wm. Oldright, M.A., M.D.)

Dr. Oldright then gave a verbal address pointing out defects and errors commonly met with in the disposal of sewage, more especially with reference to drainage and sewerage. The following is a summarized report of his remarks :—

When asked to bring some subject before the Convention he had chosen a broad title so that he might take up such special portions and such treatment of the subject as would be most profitable and suitable to the occasion, after it was seen what papers would be read. For the same reason he had not prepared a written paper.

His friend and colleague, Prof. Galbraith, having undertaken to point out "The Requisites of a Good System of Sewerage," (which undertaking had been carried out in a paper just read), it had seemed desirable that the obverse side of the shield should also be shown, and he (Dr. Oldright) had therefore concluded to point out some defects frequently found in sewage-disposal in actual practice.

In order to do this in some methodical manner he had jotted down in synoptical and classified form the desiderata of good systems of sewage-disposal and sewerage, and would afterwards proceed to give instances of the violation of each.

These desiderata are as follows :—

1. To remove all the waste products of households that are liable to become injurious by decomposing and giving off gases injurious to health, or it may be germs of disease even before decomposition.

2. To remove them completely—not to allow any to remain behind.

3. To remove them before they can decompose. To disinfect, if necessary. According to the best authorities nothing should remain more than twenty-four hours in any part of a system of sewers.

4. To remove them to a place where they cannot by their subsequent presence do harm.

5. In their method of removal to take care that the gases which they invariably produce are not allowed to accumulate, but that there be a free ventilation through sewers, drains, soil-pipes and waste-pipes.

6. That means be provided to direct the necessary escape of the gaseous contents of sewers to points where they cannot come in contact with human beings, and to prevent all escape at points where they may come so in contact.

We can, by a few illustrations, see the numerous ways in which these principles are violated :—

1. For violation of the first we have not far to seek. In the large majority of our back-yards we have not only the refuse of kitchens and slop water thrown upon the ground, but we have decomposing masses of the most offensive filth stored year after year in pits dug in the ground. These pits are constantly polluting the air, the soil, and the water of adjacent wells with their foul emanations. He did not wish to dwell long on this subject, but he felt that too strong terms of abhorrence could not be used in relation to this prevailing system, which is a disgrace to the civilization of the nineteenth century. The effects on health are bad at all times; but in times of epidemic they are liable to become extremely bad. A fruitful condition for the rapid spread of any epidemic is thus provided. The dry earth system is much more simple and easily managed than most people imagine ; either that or the water carriage system should be introduced. The latter only when proper facilities exist.

2. The second principle laid down is, that the waste products should be removed *completely*. As an example on a large scale of how this is not done, he would refer to the case of the Toronto Asylum for the Insane. An unusual amount of sickness prevailing in that institution thirty years ago, led to an examination of the drains. On taking up the floors, an immense amount of sewage was found, and it was discovered that the contractor who laid the inside drain and the contractor who had laid the outside one had failed to arrive at such an understanding as would lead to a connection being made

between the drains, several feet of earth, it is understood, having been left between the two, and the sewage of years had accumulated under the floors.

The lecturer was personally cognizant of a case in which a sink had been put in, the end of the waste pipe carried through the floor, and no attempt made to connect it with the drain.

But far more commonly non-removal or incomplete removal of sewage matter arises from drains becoming leaky or choked.

Sometimes no sufficient attention is paid to securing a good foundation for the drain, and it assumes a zig-zag outline, the pipes running alternately up and down. The connections become broken or opened out, whilst at the same time the sewage lodges in the depressions, and we have extensive soil pollution.

The connections, too, are often open, because the workmen have not taken the trouble to secure concentricity of the pipes, and to properly fill the joints with suitable material.

Sometimes a small tile is entered into a large one without any tapering reducing-pipe, the large opening between the two being filled with cement or blue clay, and rats will work their way through, leaving openings into the drain.

Again, drains become choked by rootlets of trees making their way into them, if proper care to prevent this has not been taken.

Brick house drains—which should never be used now—are often opened by rats, and discharge sewage into the soil.

If drains have to run through a house, they should not be under ground, or hidden from sight. They should be of suitable materials, as described in the previous paper, and run along the walls. If covered, they should be easily accessible to sight.

In all cases of soil pollution or surface pollution under houses, or in their immediate vicinity, we have to bear in mind that the heated air in houses creates a constant ascensional current, drawing with it impurities originating below.

3. Many of the causes already mentioned as liable to interfere with the complete removal of sewage matter are in other cases productive of delay, even though not allowing the escape of sewage. Uneven foundations, and uneven drains, flat bottoms, and obstructions may be mentioned amongst these. I might also point to instances of too little fall, insufficient flushing, junctions made at right-angles, and allowing of deposit. The keeping of decomposable material in the drains for a long period gives rise to a generation of foul gases which are apt to force their way into houses at badly constructed points.

4. The fourth desideratum laid down means, in other words, first, that where sewers are used there should be a suitable outfall, and that they should not pour forth their contents in places so situated that offensive and injurious contamination of the air or drinking water of populous districts must result; secondly, that no decaying, decomposable or offensive materials of any kind should be deposited in situations where they may do harm.

I think I am safe from the charge of violating a secret if I say that the bay and water front at Toronto are not the best place in which to pour out the sewage of Toronto.

I have, however, heard it more than whispered since I came here that we need not travel one hundred and fifteen miles from London to find an example of a watery highway rendered very insalubrious from its being used as an outfall.

I may also be permitted to refer to those places in which epidemics of typhoid fever were investigated last year. In one, the water supply was affected by improper outfall of sewage; in the other, a small creek flowing slowly through the town is transformed into an open sewer. In a town still further east a great discussion took place as to whether water-closets, etc., should be connected with the town sewer. The question was wisely decided in the negative.

I have referred to these cases to show how important it is for municipal authorities to have carefully considered the question of outfall before deciding upon a plan of sewage-disposal or the construction of sewerage works. In the last case I have alluded to, a great outlay of money might have been saved had this question first been considered.

In illustration of the violation of the principle that no decomposing, decomposable or offensive material should be deposited in places where it can do harm, the lecturer regretted that he was able to cull numerous instances from the practice of municipal officers, as well as

of private individuals. He could point to scores of "eligible building sites" made up of the mortal remains of cats and dogs, the emptyings of straw ticks, of kitchen refuse, and other decomposing animal and vegetable matter. After the grass had covered the surface of these lots, they were as pretty to look at as any other. Provided the houses erected over them were placed on posts and a free circulation of air allowed underneath the floors, harm might not result; but it could be readily understood that if the walls of the house were sunk into such material, the constant up-draught of the heated air of the house would draw up the gases and low organisms to be found abundantly in such a soil.

In Memphis the visitation of the epidemic of yellow fever a few years ago was partially attributable to the deposition of garbage in the city. And we do not need to go as far as Memphis to find isolated cases of harm from this procedure.

5. In old systems both of house drainage and of sewerage, the only thought seems to have been to provide a mode of escape for the sewage. That great harm may result from the accumulation of gases and germs in the stagnant air of drains, does not seem to have been much thought of, nor do the causes of the danger seem to have been provided against.

It will be self-evident that the danger arising from the gaseous contents of sewers finding their way into houses, and coming in any way in contact with human beings, will be minimized by their being rendered as innocuous as possible, by their being freely mixed with and replaced by fresh air. For this reason there ought to be free ventilation through house, drains, and sewers. In house-drains this could be secured in the method shown in the diagram hung upon the wall,* in which B. is a special vent pipe running from the drain outside the house to the roof, and A. is a soil pipe continued up through the roof, no trap intervening between the two. In winter A. will generally be warmer than B, and the current will be down B. and up A. In summer with the hot sun shining upon B, the current may be reversed; provided that both pipes run to the roof, this will make no difference; there will in either case be a through circulation of air, and as the two pipes seldom be of willthe same temperature this circulation will nearly always take place.

It will be evident that the practice of some architects in leaving the pipe B. cut off short under windows is not in all cases to be recommended. The current will generally be down the short outside pipe, still it may happen to be the other way, as for example, if the short pipe is on the south side of a wall, and the hot summer sun in producing an ascending current up the wall. Again, when a discharge of water or sewage takes place down A. the gas will always proceed up B.

The best method of securing a free ventilation through sewers had recently been discussed in a paper entitled "The Overhead Ventilation of Sewers," read by the lecturer before the American Public Health Association at Detroit, and had met with the general approval of that meeting.†

6. (*a*) The method of ventilating the sewers at the level of the road-bed, bringing the gases and germs up at the feet of wayfarers, and opposite doors, windows, and air ducts is a violation of our sixth desideratum.

(*b*) Instances were also given of its violation by house-drains leading gases directly up into the houses from the street sewers without the intervention of a trap or vent at all. In one of the towns visited last year, box-drains were found without any trap or vent, bringing up the gases from a large box-drain with a broken bottom and containing portions of the contents of cess-pools which flowed into it.

(*c*) The same occurs on account of bad connections and joints in the inside plumbing. A flagrant case of this kind was alluded to as having occurred in a public building in Toronto, where a connection between two slip-joints of a ventilator from the soil pipe was made by a piece of rag stuffed into the joint, one pipe being about an inch larger in diameter than the other.

(*d*) By traps being forced by gas, owing to the want of a vent pipe to let the gas off.

(*e*) By traps being syphoned owing to the same defect.

(*f*) By traps being sucked empty from the existence of the same defect.

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* See diagram in the pamphlet "On the Disposal of Sewage," p. 221 of this Report.

† See p. 188 of this Report.

(*g*) From alterations in the plumbing, leaving some pipe open, or from the wrong placing of traps and vents.

(*h*) Often the water-closets and urinals of a house are supplied directly from the same system of pipes which carry the drinking water. Sometimes the pressure is taken off the pipes, and they become emptied of water and draw in air from the closets. This air may be foul or contain germs of disease, and it may become mixed with the drinking water and produce disastrous results. Instances of this may be obtained by a perusal of the reports of the Local Government Board of Great Britain, or by an abstract of some of these in Wilson's Hygiene. In Caius College, Cambridge, a severe epidemic of typhoid fever was caused in this way, although the air had been drawn in only once or twice.

(*i*) Absorption of sewer gas by tanks containing drinking water had repeatedly given rise to trouble. Closets and urinals should always have their own separate tanks, and the water from those should never be used for drinking purposes, nor for washing milk pans, etc.

The objects of pointing out and illustrating the various defects are several.

First, there may be many here who would like to compare notes on these points, and can give the details a practical bearing, in connection with works of the kind in existence or in contemplation. It may lead the householder to see defects in his own drains and plumbing system.

Secondly, the illustrations may lead many to an increased appreciation of their duty in supporting and urging on health authorities to prevent and remedy such defects; and to urge upon councils the necessity of appointing health officers and of enabling them to carry out proper regulations regarding drainage and the disposal of sewage.

Thirdly, it would be shown that it is desirable to obtain further legislation to give municipal authorities greater powers in connection with these matters. And of course legislators will not move too far in advance of the expressed views of the people. We want then to get the people to understand better what is necessary and what mischief has been done or allowed in the past, and to urge legislators to act.

We ought to have by-laws enacted and carried out prohibiting such defects in plumbing as will endanger life.

All plumbing work should be open to inspection, and should be inspected, to see that these defects are avoided.

There should also be some guarantee that men engaged in plumbing do understand their business; that their want of skill will not subject others to loss of health or money.

The lecturer closed with remaks relative to the importance of the plumber's art and the work of drain construction, and urged that all present should use their influence to obtain regulations which would elevate the practice of the art of plumbing and secure competent plumbers, and which would lead to the adoption of a systematic inspection of the plans of the plumbing, and other sanitary requisites of houses, before the erection of these, and of the work in connection with such requisites whilst it is being done.

Local Health Organizations.

(An Address by Dr. P. H. Bryce.)

Mr. Chairman, Ladies and Gentlemen,—There are those present who will be able to discuss eloquently, and view with much greater satisfaction than myself, the changes which have taken place, and the progress which our Province has undergone in almost everything pertaining to municipal organization.

There has probably never been a more admirable illustration of the deep-seated and firmly-rooted ideas which, for more than a thousand years, have formed the leading principles underlying the self-government of the Anglo-Saxon race, than the evolution of municipal organization in the English-speaking Province of Ontario. It is not alone the well-to-do immigrants who have been active promoters of this organization, but the same ideas of sturdy independence which have taken the pioneer into the back-woods have

been those that have impelled him, with his neighbours, to organize for their mutual advantage.

How the development has taken place is worth a brief moment's consideration. The settler, following nothing more than the trail marked by *blazes* on the trees, has at length erected his rude log dwelling on the fertile bottom lands of the beaver-meadow along some meandering rivulet; others have from time to time come in and settled here and there around him, and gradually a little community has become formed. These settlers have banded together first at the *raising* of the log houses, and have assembled at the logging-bees; thereafter they will have bridged the little stream for neighbourly convenience, and by-and-by, in the largest kitchen, probably that of the first pioneer and father of the settlement, some winter evening the neighbours, in pleasant chat recalling memories of the old land, determine to put up the log house and have a school in the winter, in which sometimes they hope to assemble, and on the Sunday hear preaching from some faithful itinerant missionary.

Such are the first steps; but soon other questions arise. A post-office is needed, and they assemble again to discuss the matter (this time in the school-house) and a petition to Government is framed and signed. But this growing settlement is becoming an exporter, and soon the question of road-making comes up. This implies the expenditure of capital, and something like a permanent committee becomes necessary to concert measures for road and bridge-making. The informal meetings become regular, and a yearly committee has been appointed. The municipal council is in existence; it has become the local government. Larger questions, however, arise, and these settlers cast their votes on matters pertaining to provincial and national interests. Yet in all of this we have witnessed there is what still remains a glorious fact, and one ever symbolic of the freedom and individual independence of Canadians, namely: that the more nearly every individual is made a law unto himself the more complete becomes the development of municipal government, and the nearer do we come to the glorious ideal of popular government, that of representation of the individual voices of the people.

For a moment let us examine some of the results flowing from the development of the municipal idea. The 1,920,337 inhabitants of Ontario have organized themselves into some 650 divisions for municipal purposes, these consisting of gradations, beginning with several townships combined into one municipality, through townships, villages, towns and cities, each succeeding organization being simply the evolution of the simplest first form. This number gives an average of one organization for every 3,000 of the population. These 650 municipal organizations have powers to pass by-laws, borrow and spend money, and assess the people to the extent of the expenditure incurred for roads, bridges, public buildings, railroad bonuses, sewers, water-works, etc. But they have, in addition to this, established among them from year to year, schools, until these have mounted up to the magnificent total of 5,238 public schools, reported as open in 1881, or one school for every 366 souls of the population, while in them are employed 6,962 teachers (3,302 males, 3,660 females), or one teacher for about every 270 of the population. Besides these there are 104 High Schools, with 333 teachers. In addition to this magnificent illustration of the belief which our people have in the promotion of the intellectual health, we have scattered over the Province over 2,000 regularly ordained clergymen who, with many divinity students, local preachers, elders, deacons, etc., are actively engaged in the promotion of the spiritual and moral health of the people of these 650 municipalities.

Without going into details concerning municipal expenditure in general, I may state that the total expenditure for education in Public and High Schools, leaving out entirely universities and colleges, amounted, in 1881, to $3,190,121.94. I have seen no calculation showing how much was expended for religious purposes, but we know that it reaches a very high figure indeed. But we must remember that circumstances have arisen which prevent religious education from being looked upon as a municipal institution.

I wish now to draw your attention to what I am sure will strike you as being somewhat singular in the evolution and development of this wonderful system of municipal government. We have seen how material wants have been attended to in the building of roads, bridges and public buildings; we have comprehended how intellectual needs have been supplied in the development of our school system, and appreciate to some extent

how the moral and spiritual interests of the community have been watched over by the churches; and we now naturally turn to examine how and to what extent this municipal organizing business has gone on in attending to the physical needs of the community.

In the Municipal and Health Acts of the Revised Statutes we find that there are a number of sections pertaining to the public health. They appear to have been inserted there by some spasmodic effort after some of the old time small-pox and cholera years. They first affirm the principle that municipal councils have the power to appoint a committee consisting of those of their own number, wholly or in part, or of other persons to whom their power in such matters is delegated. Last year, when the Provincial Board was established, a circular was sent to the clerk of every municipality requesting him to inform the Secretary of the Board whether his council had organized its Local Board of Health and if it had enacted health by-laws. From the 650 municipalities the following forty answers have been received up to this date :—

SYNOPSIS OF ANSWERS RECEIVED.

TOTAL ANSWERS TO CIRCULAR FROM CLERKS AND MEDICAL MEN.	NO OF BOARDS FORMED.	ACTIVE.	INACTIVE.	NON-ORGANIZED.
1882. 40	1882. 39	1882. 33	1882. 2	1882. 4
1883. 208	1883. 41	1883. 22	1883. 6	1883. Questions not answered by remainder.

Now, I must make one word of explanation here. It will be seen that five times as many answers were received this year as last, the agreeable fact no doubt being due largely to the fact that the circular this year asked some twenty-one questions requiring categorical replies, while last year the general character of the circular either permitted a general reply, or, as for the most part happened, secured no attention whatever at the hands of municipal clerks.

We gain the information, however, from the two circulars to the effect that no very definite advance had been made between 1882 and 1883 in the matter of local health organization, arising, in some cases at least, from the fact, not that the municipal councils were wholly regardless of these matters, but because they had no very well defined idea of how to go to work. During the past year a pamphlet has been issued by the Board which, from various enquiries leads me to hope that considerable progress is taking place in the matter of local health organizations.

However, I am not going to discuss that question any further now, but simply wish to refer to the facts, gathered as best we can.

We see that a little less than one-third of all the 650 municipalities have been heard from. Assuming, as we have a right to, that all not heard from could not answer the question concerning local boards in the affirmative, we have only 41 boards formed, and only 22 of these which can be said to be active.

With the exception of two or three of the larger cities, we may say that no appropriation of moneys for health purposes has been made by the council. Such then is the singular and phenomenal fact in all this municipal organizing. Material well-being, intellectual well-being, and spiritual well-being, are all taken in hand; but physical well-being, that on which all the rest directly or indirectly depend, has been left to shift for itself. But someone says "it has been quite unnecessary; in fact we feel as if in this regard we have eager, *disinterested* and self-sacrificing friends about us in the doctors,

who have been only too anxious to take care of us, and, indeed, we have a shrewd suspicion that, were there not so many of them, we might be better off." Well, ladies and gentlemen, in one respect I believe you are correct. Now, I want to show you how you are correct. Supposing that the medical fraternity were suddenly to be exterminated by a fatal epidemic of *health* suddenly arising, you would certainly be many times better off in your pockets and in the general increase of happiness. But let us assume that, the doctors having been exterminated, the wheel of fortune suddenly gave a turn, and an epidemic of some fatal disease broke out. Now, some one of several things would happen. You would either appeal to your oracles for help, and find none; turn frantically as did the frightened mayor and corporation of Hamelin Town, in Brunswick, to some pied piper and offer a thousand guilders to rid yourselves of the plague, as they did of the rats; or most likely you would act like good, wise and intelligent citizens, set to work and prevent the spread of the disease by isolating infected cases and limiting the free development of the cause. But, you know, we are all so indolent, and so few of us like to think long of unpleasant things that we are always trying to depute our responsibility—as it were to have others get absolution for us—to someone else, and to whom so willingly, to whom so pleasantly, and to whom so safely as the doctor? For excesses in dining out we ask the doctor, and he gives us our *after-dinner pill;* for neglect and indolence in taking a morning bath he gives a *diaphoretic;* for allowing filthy surroundings provocative of fevers we ask and get *quinine;* for living in vitiated atmospheres and for neglecting exercise we ask for a *tonic*, and for over-work and other draughts on the nervous system we look for *sedatives* and get them.

And, ladies and gentlemen, you will always find your doctor so kind, so attentive, and so obliging—providing you pay him. He smiles, gives mild advice,—because he knows that strong advice won't be taken—repeats Shakespeare when he says,

"What fools we mortals be,"

and goes his way to apply salve to somebody else's conscience for their own wilful neglect of the commonest and most ordinary laws of health.

Do I blame the doctor, ladies and gentlemen? No. It is your fault, and not his. There is a whole field of municipal organization as well as personal regulation lying before us untrodden, and we the people it is who have been and ever will be the constant sufferers from neglecting it. How is it to be accomplished?

We have seen in the evolution of school organization the progress of our school system up to its present high state of efficiency; we have observed how the pioneer settlers began with their little log school house, and with the classes carried on for three or six months of the year. We remember the early years of government supervision, with a Superintendent of Education and Local Inspectors; but we now behold the uniformly developed system under a Minister of Education with an organization homogeneous in character and completely equipped in all its branches. Something of the same thing ought to exist, and something of the same kind shall, I have no doubt, ere long exist, in regard to health matters, as in Great Britain. There is Sir Chas. Dilke, the President of the Local Government Board, whose oversight and control extend to every town and township in all England and Wales; New York State has its State Board, with established relations between it and some 24 cities, 340 villages, and 930 townships; Michigan, a State in many ways newer and less advanced than our Province, has its Board in every town, village, and township, working in connection with its energetic State Board; and I mistake very greatly the feelings and temper of our municipal communities, if the same progress which has been shown by them in their school system, their agricultural, horticultural and other societies will not soon show itself in the still more important personal, social, and national work of organizing for the promotion of national health.

The form of municipal organization varies in these other places which I have mentioned; but in all of them which are all Anglo-Saxon communities, the same underlying principles prevail. We must then look in our local health organizations for just such developments of the municipal idea as we have seen in our schools. There we have public schools, of one teacher, then several; thereafter we have union schools; then

public and High Schools; then Collegiate Institutes; then our Colléges and our Universities; and finally the Council of Public Instruction, with its official head the Minister of Education. The whole is a unit in the best sense of the word. How had it been possible for us to obtain the exact number of schools, of teachers, of scholars, and of the amount of money expended, were it not for such an organization? And can any one say that it is not of even more importance that we shall know how many lives are annually lost to their friends, their Province and its wealth; how many cases of infectious diseases have occurred which might to a large extent have been prevented; and what organized means is present, and what proportion of municipal expenditure has been set apart for the promotion of life and health, which in every sense is wealth?

With a Provincial Board having oversight in every municipality, we shall then expect to see every village, town and city have its own Local Board, meeting regularly weekly, monthly, or quarterly as necessity may demand; we shall expect to see such Board, organized at the beginning of the year, present an annual report to the Provincial Board at the close of the year, of the general state of health during the whole period; what infectious diseases have broken out, their extent, virulence, and the means taken for their restriction. As in most cases the municipal clerk must be the secretary, we in this way shall have the same official aided in his other work as registrar in getting better registration returns than have hitherto been possible. Such then would be the first work which a Local Board will do on organization. Let us here however enter a little more into detail.

We have said the township is the simplest form of municipal development. Who then are likely to be its most efficient Health officers? To me the following seem to be the natural guardians of a township: the Reeve and Clerk; and in addition to these ought to be selected for three years from amongst the ratepayers, one teacher, one clergyman and one private citizen to act with them. In this way we have not only every interest represented, but we have just those men who are likely to take the most comprehensive view of, and at the same time the most active part in all pertaining to the public weal. Such, with slight alteration, would be the complexion of a Board when two or more municipalities united to have a single Board. A similar arrangement might be made for villages and towns. Thus there would be the Reeve, Clerk and three ratepayers elected for three years. In cities and towns of over 4,000 inhabitants, according to British experience, and because more difficult questions and larger interests are at stake, I should advise a somewhat larger Board, elected by the people on the same franchise as municipal officers generally, but to remain in office for three years, a third retiring every year. With such a Board the Mayor should act, being at once the link between the money-granting Council and the Board, chairman of both, and in sympathy with both. In all matters involving expenditure of large sums, the estimate should be voted upon by the people.

At present, as most are aware, the Local Board is a committee of the Council, and hence, like it, a panorama with ever shifting views, one year's Council often reversing the policy of the next. The consequence has always been that such committees, being interested in other municipal matters, have in all cases neglected matters of interest to health. These two reasons ought to be enough for divorcing the Health Board from its present relations to the Council. Should others be wanting we have arguments from analogy. Our Boards of Trustees are perfectly distinct from other municipal officers, even having the power of assessing, and are in many cases men who have been selected on account of special fitness for the position. So in like manner we should expect that the township, village and town officers mentioned would be, along with the elective members, such as are best fitted for acting in regard to health matters.

But the last and strongest reasons for appointing Boards in this way are that there will be with them (1) independence of action, (2) comprehensive views and united ideas, (3) and finally, work begun one year on an extended scale can be completed under its originators, and the money spent will, in three years, have had time to bear legitimate fruit, and credit will be given and blame laid, in all cases, on the right shoulders.

Under Boards thus organized we shall expect, as we have school inspectors, to have health officers and health inspectors.

Such again, as in England, ought to be appointed by the board, the appointment being sanctioned by the Provincial Board. Having been once appointed, such officer ought not to be removed except for good cause. Hence the Damocles' sword, ever pendent over the head of the municipal officer, will be removed and his position will be secure until the Provincial Board has, on investigation, found that the charges against him are well founded.

Such then, in outline, is my idea of municipal health organizations. The next point that we naturally arrive at is that of *ways and means.* Now, municipalities have never been noted for liberality, and my short experience has proved this to me, that councils have been averse to moving in the matter of public health, not because they have not appreciated the necessity in many cases for action, but because they have been afraid of voting money for health purposes.

How are we going to get at the difficulty? Let me again turn to our school system for an answer. I there find the expenditure for public school purposes, in 1881, made up as follows:—

For teachers salaries,	
(1) Per legislative grant	$195,217 87
(2) Municipal grant	346,070 07
(3) Trustees, school assessment	1,455,747 52
(4) Clergy reserve fund, balances, etc.	500,710 66
	$2,497,746 12

For High Schools and Collegiate Institutes:—

Teachers salaries,	
(1) Legislative grant	$83,288 32
(2) Municipal grant	200,814 61
(3) Fees	30,891 08
(4) Balances, other services	56,256 01
	$371,250 02

Or, for all school purposes, excluding colleges, we have the magnificent total of,

For Public Schools	$2,497,746 12
For High Schools	371,250 02
	$2,868,996 14

We thus see that in the educational system the relations existing between the Government and the municipalities are intimate in regard to expenditure as well as to control. The principle has been adopted and acted upon that educational interests require that the central Government encourage municipal expenditure for promoting efficiency in schools by granting certain sums to every municipality. Now the argument from analogy is plain. If we were to suppose that every municipality was both able and willing to assess itself to the extent of supplying funds sufficient to promote efficiency in schools, governmental aid would be unnecessary; but a paternal Government, knowing that many municipalities are not rich enough to supply efficient school facilities, and that there is in many cases an unreasoning prejudice amongst the ratepayers to being assessed by their local appointees, has undertaken to make up the deficiency by legislative grants. In the same way we see that if the premises be granted that expenditure in health matters is necessary by its being shown that life, happiness, and wealth would be increased by the judicious municipal expenditure of moneys for health purposes; and that inasmuch as the general public are not as yet so educated in health matters as to properly appreciate the benefits to be derived as they are in matters of education, it follows with greater cogency of reason, that the Government would be justified in setting apart a sum of money to be granted to those municipalities which are anxious to improve their sanitary condi-

tions, on the condition that these first raise, as in the school system, a certain amount by municipal assessment.

Again, it ought to come within the province of any Government to grant to municipalities whose circumstances in regard to health are unfortunate, and which are at the same time financially poor, sums of money to be paid in such directions as would produce permanent improvements in the local health conditions. The principle has been adopted and acted upon to a limited extent already in the matter of vital statistics, by the Dominion Government; but as local health matters are under the jurisdiction of the Provincial Governments, any such system must necessarily emanate from them. Without going further into details we would say that efficiency in the matter of the public health is primarily dependent upon the formation in every municipality or group of municipalities of a Local Health Board; that under it shall be appointed a Medical Health Officer or at least a Sanitary Inspector; that the latter shall be the Executive officer of the Board, as the teacher of the trustees; that he shall report to the Board, and it to the Provincial Board; and that the latter shall thus establish not only intimate relations with all, but will be the adviser in and promoter of sanitary improvements, and shall advise, under Government sanction the expenditure of public money for such purposes.

We have shown how municipal organization in other respects has been developed, and how municipal sanitation has, through it all, been in very large degree forgotten or neglected. We have shown how such municipal sanitary organization is to be accomplished, and now we have to take up the last point of indicating its necessity. Into this subject I have not time to enter at length, since to do it justice would require the time of a whole Convention.

The other subjects on the programme in your hands suggestive of sanitary needs, and the facts brought out in the papers and discussions must tell too truly, indeed too mournfully, of what the neglect of hygienic rules results in. But in this connection I shall limit myself to some facts which I have gathered from statistics of various kinds, of the County of Middlesex and its municipalities. I do this, ladies and gentlemen, from the reason that all present must be interested, as well as from the fact that the statistics are taken from one of our largest, wealthiest, and probably healthiest counties, and hence I cannot be accused of wishing to draw a dark picture or look on the cloud's dark exterior. Whether any will be able to see a silver lining to it must depend upon future action.

The insuring of wholesome water supplies is of the primest importance to health, as Mr. Saunders has told us. The evils resulting from conditions of which mill-dams are the type, will have been shown to us; while the sanitary results following such disasters as the London floods have been clearly pourtrayed. School hygiene in its various branches will, to-morrow, be discussed, while Typhoid and its ravages, and the dangers and benefits from sewerage systems, have been or will be presented to us from various standpoints. In a paper to be read by me to-morrow you will learn how Consumption kills its thousands, and this largely through dampness and foul air.

The county is composed of the large number of twenty-five municipalities, consisting of one city, two towns—if we speak of London East and London West—seven villages (incorporated), and fifteen townships. To the clerks of each of these the following circular was sent with the result that five answers in all were returned to the Secretary of the Provincial Board, although nothing more was required than to fill up one page opposite numbers for each question. The municipalities which honoured the Board with a reply were the following (*Vide* circulars and answers pp. 148 and 159, Appendices of this Report):—

London City—all the cities.
Glencoe, Ailsa Craig } $\frac{2}{7}$ of all villages.
Metcalfe Tp., Westminster Tp. } $\frac{2}{15}$ of all townships.

Now what do these facts teach us concerning this county, one of the richest and best organized in the Province. Let us summarize:

Of the twenty-five municipalities we find that the clerks of five municipalities have taken enough of interest in public health matters as to think it worth while to spend five or six minutes in giving information on some questions affecting the life and best interests of 92,081 inhabitants. This is bad enough indeed, and mostly accounts for the conditions exemplified in the answers returned. Two municipalities alone have taken advantage of the powers given them under the Health Act, and of these two, the Clerk of London representing the conditions under which over 19,746 individuals live, states, that though the Board was organized it was not in an active condition. I trust he will not be abused for stating the facts which are evident from what had already been stated, and yet there is more to follow. But why need I linger discussing the unpleasant and disagreeable condition of affairs, laid bare by the few communications I have been favoured with. Suffice it to say that there is not a single question, but shows in the most unequivocal manner that with all the attention to things material, good houses, good barns, and good roads; to educational matters as we have already seen, by which Middlesex spends $130,791 for public schools alone, there has not been a single instance of organized attempt to improve the original, crude sanitary arrangements, inherited from Britain of half a century ago, and adopted here in the early history of the Province, when pioneer settlers had to struggle with poverty and a hundred inconveniencies to which they are now strangers. Hercules' other labours have been finished, but the Augean stables still remain uncleansed.

But let us speak of another general fact, showing how very little attention is given to matters of health. I have obtained from the Registrar-General's Tables the following statistics, from which I gather some very important and interesting information. Knowing the Province pretty well I am inclined to think that with the health conditions of our various large towns and cities, we have something like an average mortality of about twenty in the thousand annually :

	1880.		1882.
Thus—Toronto had	18.1	....	20
Hamilton,	17.0	....	18
London,	20.2	....	16
Kingston,	21.4	....	22

We see that roughly the mortality for the various cities during these two years averages about the same in Toronto, Hamilton, London and Kingston, or quite as much as the mighty City of London, England, with its filth, misery and crime, which we have read so much about in the papers recently.

What I wish to call your attention to here, is the fact that London varies so much in the two years recorded, as to cause one to imagine that the deaths for one year may not all have been registered. However this be as regards London, I am confident that enormous defects exist in the registrations for some of the townships. I have gone to the trouble of obtaining a few typical examples.

The remarkably cautious clerk of Metcalfe, already alluded to, has returned deaths amounting to just 5 in every 1,000. I suppose this was done in order not to hurt any person's feelings. You see too, that in the answers to questions received, we are informed that he knows of no cases of epidemic diseases, yet unfortunately the caution did not prevent the registration of at least one death from diphtheria.

But to further show how unreliable apparently are the returns, we have the following :

	Population.	Deaths.	Per 1000.
In Adelaide..................	3,108	58	19
" East Williams..............	2,195	36	16
" West Williams	2,339	19	8
" Ailsa Craig................	872	13	15
" Glencoe....................	801	4	5

	Consumption.	Diphtheria.	Typhoid.	Scarlet Fever.
Adelaide..................	3	10	3	3
East Williams	10	4	—	—
			Whooping C.	Scarlatina.
West Williams	3	3	2	1

From these it will be seen that there is no relation at all between the prevalence of contagious disease and the rate of mortality in these townships. Assuming that consumption and some other diseases are of almost the same prevalence in these several townships, and that it is the epidemic diseases which create the greatest differences in mortality returns, we have indubitable proof of incorrectness from the fact that while West Williams returns one and a-half times as many deaths from contagious diseases as does East Williams, the mortality in the former is only returned as one-half of that in the latter. Can anything be be more plain than that in matters of municipal health organization we are still in the incubative stage, and that, as far as actual knowledge of the amount of preventable disease present in the country goes, we have but an imperfect idea.

But passing on to another point of interest as indicating the great need of something more being done than at present exists, let me refer to the mortality as it was returned in London last year.

Assuming the population of London to be one-fifth that of Toronto, we find that the deaths from

	Total.		
Typhoid in London..............	22	=	1·2 in 1,000
" Toronto..............	61	=	0·6 "

In other words it was twice as prevalent in London last year as in Toronto. Diphtheria, however, was very different, since

	Total.
In London	3
" Toronto	57

or but one-seventh as prevalent as typhoid in London, but nearly as prevalent as typhoid in Toronto. Now, the conditions determining the prevalence of typhoid seem to be largely those which make diphtheria malignant, and had diphtheria once obtained a good foot-hold in London there are no reasons why it should not have been proportionately increased.

I need not again recount the absence of those measures which limit its spread. The school law regarding infectious diseases does not seem to be enforced in London, nor are isolation precautions, except so far as observed by the practising physicians, put in force.

But I close these remarks, trusting that the lack in our municipal organizations in regard to health matters has been made evident; that the means by which it is to be supplied have been already explained, and that ample proof of its necessity has been given. To say that our mortality in Canada, as compared with other countries, is an average one —even were this proved true—which it is not, would be but a poor argument to give to the mourners of over 251 children, the hope of fond parents, from one disease; and for the death of 192 who, mostly arrived at man's estate, have been removed from the support of those for whom they have laboured. To us the question is, are there not good and sufficient reasons why in, a humanitarian sense, why for family reasons, why for economic reasons, and why for national reasons, the great proportion of these deaths should not have been prevented?

Two years ago, the whole Dominion was thrilled with the news of that dire disaster which befell your city on that fateful day of May, and yet it will hear with perfect unconcern of the fact that at the rate of mortality of last year as many will go down to silence in the next ten years from the one disease, Typhoid, alone, as did in that holocaust of two years ago. All remember the indignation which asserted the accident was due to carelessness: can any say that the deaths from Typhoid will not be largely due to neglect as culpable?

The desolation from the London Floods last July appears as vividly to me as to you, and as vividly do I recollect the magnificent work done by the relief committee of London. But who is responsible for the fact that London West found itself at that time without any Health Board, and could any one say that London did not do almost more than her duty in so liberally helping those who had been so slow to help themselves? As remarked by Frederic Harrison: "The healthiness, the good management, the organziation of our cities and towns and villages affect the great masses of the workmen more than they affect

the rich, who can afford to withdraw or supply themselves with sanitary necessaries. Good air, pure water, drainage, light, recreation grounds, schools, baths, and the like—these are the very breath of life to the working masses, who can only obtain them by sound municipal government. It has always seemed to me that a great field lies here for the energies of the working class, and for the influence of their great trade organizations. Here is a subject which concerns the workmen, their wives and their children, their lives and their health, and their whole mental and bodily culture—a subject which workmen have under their eyes, the immediate results of which they can fully perceive. They can insist on having pure water, healthy cities, worthy schools, museums and colleges; but to exercise the influence that they might they must enter more than they do into local self-government. They must become more often members of their school boards and health committees of towns, councils, and municipal bodies." Lord Salisbury, by an article in the *Westminster Review*, has brought the question of better homes for the working-classes into the realm of practical politics within the past two months, and to-night, ladies and gentlemen, I place before you the question, before all our Province the problem of what we are going to do in the matter of municipal action for improving public health. Shall it not be that in the "march of mind" this health question in its physical, intellectual, and moral bearings, is henceforth to take that position in general and municipal legislation which statistics tell us is required, which practical experience elsewhere tells us is possible, and which is the goal of all true scientific research and the life-work of all sanitarians?

Effects on Public Health of Mill Dams.

(By Prof. H. Arnott, M.D.)

We are met together to discuss what should be the most important problem of human life—how to increase the sum of human happiness, how to diminish the sum of human ills. This honour and privilege falls to the lot of the medical profession, and it remains to be decided, largely in the field of preventive medicine, how we shall acquit ourselves of the responsibility, whether we shall be regarded as parasites living on the people, or the friends and benefactors of the race. But what is prevented is not always seen, and often its very existence is doubted, therefore we need not look for the appreciation and assistance here that we might justly expect in other fields of labour.

Accordingly it becomes the duty of every physician not only to inform himself, but to diffuse among the people a knowledge of the causes of disease, in order that they may understand, appreciate and intelligently co-operate in measures for their prevention. In this work may we not hope great things from such meetings as the present?

But the deadliest foes to our health are imperceptible to our senses, and, so far, have eluded detection by scientific research. Too minute for the highest powers of the microscope, too obscure for chemical demonstration, it is only in their dire effects that we mark the workings of some powerful cause. Their path is strewn with more victims than all the other causes of death combined, not to mention the broken health of those left to drag on a few more miserable years. And yet we believe that a large proportion of these diseases might be almost, if not altogether, prevented. If this be so, surely it becomes us to band ourselves together to drag to light such hidden foes, to discover their character and their camping grounds, and, if not able to destroy, at least to concert measures to mitigate or avoid their baneful effects.

Of these hidden causes of disease, Malaria is one of the most potent, the most universal and probably the least understood. And while it is doubtless one of the most preventible of diseases, few measures of importance have been adopted with a view to its suppression. I shall use the word Malaria, in its common acceptation, to signify the special cause of Intermittent fever, and shall endeavour to show that mill-dams, locks and other obstructions to the natural flow of the water, are its most fertile sources in this part of Ontario. I shall endeavour to show that here malarial diseases prevail much more abundantly in the vicinity of such obstructions than elsewhere, that the build-

ing of a dam or a lock has always been followed at no distant date by an increase of such diseases, and, finally, that their removal has been followed shortly afterwards by a very great diminution, if not complete cessation, of malarial troubles. I shall not refer to the special character of Malaria further than to define my position. Among the conflicting views regarding the miasmatic poison, this much seems to be common ground with all observers, that it is the product either of organic decomposition, or of organic growth and development. On the one hand it is held to be the noxious gases given off during the process of decomposition, on the other that it is the germs or sporules of the lower orders of animal or vegetable life developed during that process. The products of the decomposition of organic matter are not only various gases, but also the development of immense numbers of the lower forms of animal and vegetable life.

In other words, the destruction of one form of organic matter is always accompanied by the production of another form, which is variously regarded as the agent or the product of the decomposing process. This we see illustrated every day around us. Whether it be a dead leaf or a dead fly, a dead tree or a dead horse, death has hardly taken place till we find that enormous numbers of animal and vegetable forms, in their lower stages, have seized upon the carcase and are utilizing it for their own development. Indeed, even before death we find even the human body swarming with myriads of these beings. Whether these germs are the agents which bring about the disorganization, or are merely incidental accompaniments, I shall not pretend to say. This much we do know, that decomposition and organic growth and development go hand in hand, and whether the causative agent in Malaria be a gas or a germ, they are alike the accompaniments of organic decomposition.

And hence the difficulty of differentiating two causes which are present at the same time and which are alike incapable of demonstration to the senses. However, whether the cause of the symptoms included under the term Malaria be the gaseous products of decomposition or some of the low forms of animal or vegetable life which are developed during that process, we are equally correct in saying that it is always associated with, and largely dependent upon, organic decomposition.

The importance of this subject will hardly be questioned, whether we view malaria as the direct cause of disease or only a predisposing cause which saps the foundations of health and opens wide the gates for the entrance of other diseases to destroy the citadel of life. I am sure it will be granted by the profession that scarlet fever and diphtheria claim the greatest number of victims in patients debilitated by the poison of Malaria, whilst various other diseases, such as consumption, are rendered more numerous and more potent by its presence.

The deleterious character of stagnant pools of water has long been recognized, but mill-ponds have not been looked upon as stagnant pools, and consequently, have not received the attention which their evil importance demands. A little reflection will show that a great many mill-ponds are really worse than stagnant pools. By stagnant pools we mean such as have neither inlet nor outlet. The rainfall collects in these basins, but almost the only source of organic matter is that of their own production: This consists of both animal and vegetable matters developed under the influence of heat and moisture, the seeds or germs being derived partly from the air and partly from the soil. The animal matter consists of the lower forms of animal life, many of which live but a very short period, some not over a few hours. For instance, during the brief space of a few days myriads of gnats come into existence, mature, reproduce their kind, grow old and die. Or, look at the host of animated life that is developed in a barrel of water during a few warm days.

Many of these creatures die before maturity, whilst the natural life of others is only a few days, thus producing, through the agency of heat and moisture, large quantities of organic matter which, decomposing, soon turns the once pure barrel of water into a noisome pest.

The vegetable matter found in and about stagnant pools follows much the same law. Of the many species comprising the mass of the lower vegetable forms which are found in such profusion in such places, many varieties spring into existence, attain maturity and decay within a very brief period. The quantity of water-plants, belong-

ing to higher types, that grows in these ponds is beyond conception. I have seen a part of a pond ten feet deep so completely filled with these plants as to stop the passage of a boat and compel me to back up and steer for clearer water. I would expect that the amount of vegetable growth of this kind found in most of these ponds would exceed that of a very heavy crop of hay off an area of the same extent, and all this dies and decays annually.

Thus we see that stagnant pools have abundant sources of organic matter.

But many mill-ponds differ from them only in being the worse of the two. For, whilst the source of organic matter in a pool is confined chiefly to itself, a mill-pond collects the refuse, animal and vegetable, from a large area above and which, if the stream had not been obstructed, would have been carried to the lake or sea. And the majority of dams during the hot weather of summer permit only a small quantity of the comparatively pure water to filter through, while all the filth is retained. For instance, as in this city, the clear water filters through and the solid matter of the sewage, etc., is retained. Add to all this the same sources of organic matter as a stagnant pool and we surely have a collection of decaying matter sufficient to produce abundant occupation for a good many doctors.

To descend from the region of theory and speculation to that of actual observation, we find abundance of evidence on every hand to prove the position that mill-ponds are worse than stagnant pools, to prove that the building of a dam is generally followed by malarial diseases in its vicinity, and the breaking away of such has frequently been followed by a very great diminution of miasmatic troubles. I do not say that all mill-ponds are alike miasmatic. For we find some with such an abundant overflow of water even in the dry months of summer, as to keep their contents comparatively pure. But as the country becomes stripped of its timber and the streams diminish by consequent evaporation, the number of such fortunate ones must become less every year. I shall now relate a few cases that have come under my own observation, or have been related to me by medical gentlemen who were cognizant of the circumstances.

Case 1st.—For the history of this interesting and instructive case I am indebted to the kindness of Dr. Moorhouse, who lived in the neighborhood and whose family, as well as all those in the vicinity, suffered severely from it. The situation was on the Sydenham River, township of Euphemia, County of Lambton. Previous to the construction of a dam on the river for mill purposes, the neighbourhood was comparatively free from malarial diseases, but within a year or two afterwards it became infested with ague and its allied affections, and "ague-cakes," previously unknown, became a common production of the country. That this was caused by the dam and was not any mere coincidence was proved by the sequel. A few years later the mill was burned down and the dam removed, when the malarial troubles almost entirely disappeared, and to this day that portion of the country is not particularly malarious.

Case 2nd.—If more positive proof be desired, we can find it nearer home in a case coming under not only my own observation, but also that of several medical gentlemen of this city:

In the year 1870 I moved to St. Johns, a village on the Medway River, in the township of London. The people said it was such a pity that I had not come before the dam had broken away, as they were then all ill with the ague. They assured me that for several years previous not a family in the village had escaped having one or more of its members affected with the ague, but that since the destruction of the dam they were enjoying a respite. Can you wonder that there was universal rejoicing at what was the misfortune of one of their number, though a very worthy man, indeed?

I thought little of this at the time but I had occasion to think long and sorely of it afterwards. During that summer another dam was built, but for a year or two I heard or saw little of malaria.

During the second and third summers, however, it began to appear again, and in the third or fourth year it caught even the doctor, and used him so badly every summer after, that, in the year 1880, he was compelled to sell out his practice and leave the place. I may say that I never had any form of malarial disease before going to St. Johns, and that I have had very little since I left there. During my stay in that

place my wife and children, as well as myself, would have one or more attacks every year, until our health became so much reduced that life became almost an undesirable boon. Nor can this be said to be due to any other cause, for the trouble subsided after the destruction of the dam, and besides, no other cause can be discovered in the vicinity.

To add still further to the force of this argument, it transpired during the late great flood that this dam was again swept away. This occurred on the 10th of July, and nearly four months afterwards the doctor now residing in the place informed me that he had had only three trivial cases of Malaria since that event.

Here we have evidence of a dam twice breaking away and each time being followed by a very notable diminution of miasmatic diseases in that locality. Should better inductive evidence than these two cases afford be required for the proof of any point? or could the most sceptical question the inference which I have drawn?

Now, if you accept the evidence I have offered regarding the case at St. Johns, can you believe that there is another dam in process of construction at that place? Yet such is the case. It is the old story:—

> "When the devil was sick the devil a monk would be;
> But when the devil got well, the devil a monk was he."

The people indeed have grumbled loudly and threatened suits at law, but the quiet and determined miller has carried the day, and in a year or two that Malaria factory will again be in full operation.

But to come nearer home, I am informed by the medical gentlemen of this city that some years ago the water of Carling's Creek was dammed up to form a pond to beautify the city. The usual result followed—the neighbourhood became very malarious. But the people did not submit so quietly to the yoke as those at St. Johns. They petitioned the Council and had the nuisance removed, after which the trouble subsided, thus adding one more to the list of cases where the damming of the water was followed by miasmatic diseases and the removal of the obstruction by their subsidence.

Again, I have called upon nearly all the medical men in the city and find that they all agree on two points. First, that the building of the W. W. dam was followed by a great increase in malarial diseases; and second, that since the flood, which tore away a number of dams and thoroughly washed out the bed of the river, there has been an almost complete cessation of such diseases. To this it has been objected that the amount of water sprinkled on the lawns was probably the cause, but both theory and practical observation are opposed to such a view. In the first place moisture is not unhealthy, unless it lies long enough in a warm atmosphere to produce decomposition of surrounding organic matter and the growth of a host of micro-organisms. This could only occur where it collected into pools, for the sprinkled water, like rainfall, disappears in the porous soil, and the action of the sunlight prevents the growth of fungoid matter. Also, if that were so, our rainy season would be the most unhealthy, which is the reverse of the fact. I think I state the opinion of the profession when I say that our wet seasons, summer or winter, are our healthy ones. And it is a well-known fact that sailors, persons living in the vicinity of lake and seas, and the inhabitants of countries where the rainfall is greater than here, are not particularly subject to such diseases. Add to these considerations the significant fact that the majority of the medical men of the city point to these ponds as the source of the greatest number of their malarial cases, and surely we may safely conclude that it is not the sprinkling of the water on the lawns, but the damming of it into ponds, which caused the increased amount of miasmatic disease observed since the building of the water-works.

We have hitherto spoken only of the ordinary mill-pond, such as you might find in a country place. And we have seen how disastrous to the health of the people such a pond may be. But what shall we say of it when found near a city where it collects all the refuse and sewage in addition to its ordinary impurities?

A private citizen would be indictable were he to keep an open cess-pit in his yard to collect the sewage of one house, but in a city of 30,000 inhabitants, not far from here, the authorities permit the existence of three dams, which collect all the sewage and refuse

into three huge open cess-pools. Two of these are situated in the thickly-populated parts, and a third one farther down the river catches any filth that may have escaped the other two. To these causes may undoubtedly be charged a great amount of the sickness of that city.

To conclude, I believe that the late flood, which did so much damage to bridges and dams, was a great blessing, in a sanitary point of view, to this city and surrounding country. Nor do I believe that, in a financial point of view, the balance will be so much against us as might be supposed. For the increased productive power of people in good health, the saving of time through a lessened amount of illness, and last, but not least, the diminished expenditure for medical attendance, are a saving to the country which, at all events, goes far to balance the expenditure for bridges.

Now, if it be agreed that the removal of a dam would be the means of decreasing sickness, diminishing doctors' bills and saving valuable lives, does it not follow that failing to do so would be in the highest degree criminal, morally if not legally? Has the time not arrived when the health of the people should be the chief consideration of our rulers, and the prevention of disease wiser and more honourable than its cure?

Disinfectants.

(By William Saunders, London.)

Mr. William Saunders, of London, read the following paper on "Disinfectants":—

All agents or substances employed to prevent the spread of contagious or infectious diseases are properly included among disinfectants. The efficiency of any of these agencies is due to their power of destroying or rendering inert disease germs, which, when introduced into the system under favourable conditions, rapidly increase and develop the symptoms attendant upon special diseases. All substances which act as deodorizers, either by oxidizing or deoxidizing noxious exhalations, as well as those which arrest and prevent decomposition by their antiseptic action, will also fall into the same group.

It has been urged with much truth that strict cleanliness, accompanied by an abundant supply of fresh air, is the cheapest, most accessible, most easily applied, and the best of all disinfectants. The truth of this has long been known. Many of the injunctions introduced into the Levitical law of cleansing, as well as many heathen ceremonial practices, were evidently based on the perception of the value of cleanliness as a disinfectant, and the free use of clean water and fresh air, coupled with the isolation of infectious forms of disease, should be everywhere recognized as an invaluable measure for arresting the spread of contagion. The employment of any artificial deodorizers will be of little value if they are not associated with the oxidizing influence of freely circulating atmospheric air and the purifying influences of water. Miss Nightingale, when writing on the subject of disinfectants in hospitals, states as the result of her large experience that the rate of mortality in hospitals is more affected by strict cleanliness and an abundance of fresh air than by any other means, and where these are well attended to it is seldom that any deodorizing agents are required.

The great importance of cleanliness in cities cannot be too strongly urged, and in this direction Local Boards of Health may render most effective service. A recent writer on this subject defines filth as nitrogenized organic matter in process of putrefaction, evolving substances always detrimental to human health and life, and asserts that as the aggregate of this filth increases or diminishes, so the aggregate of human health is increased or diminished. If decomposing material is allowed to accumulate and disinfectants depended on to disarm it of its power, the restraining effect, at the best, will only be very temporary and ultimate disappointment sure. Strict cleanliness with a good system of sewerage are of the first importance, and these attended to, the use of particular agents in special cases for destroying injurious exhalations is brought within manageable limits.

While the essential characteristic of the putrefactive process is oxidation, it is singular that among the most useful disinfectants we have some which act through their power of oxidation, while the influence of others is exerted in the direction of deoxidation, and the value of a disinfectant is in proportion to its power to oxidize or deoxidize the emanations from decaying subtances, it being a matter of indifference, as to the disinfectant results, in which direction it operates. No explanation has yet been offered for this anomaly.

Chloride of lime, or more properly chlorinated lime, when of good quality, is one of the very best, cheapest, and most accessible of all ordinary disinfectants for general use, and has the advantage of being already pretty well known. It is made by passing chlorine gas into air-tight chambers filled with shallow trays on which is spread, to the depth of about an inch, dry air-slacked lime. The trays are arranged in tiers from floor to ceiling, with an air space between each. The lime absorbs the chlorine gas with great readiness, and after exposure in this atmosphere for about twenty-four hours will be found to be thoroughly saturated with the gas. When exposed to the air it absorbs moisture, and slowly liberates chlorine, and to this powerful oxidizing agent and to the caustic lime it contains its efficacy may be attributed. Spread on plates or flat dishes in a room it speedily destroys offensive odours, and after having performed its office in the dry way, it may be moistened with water and used as a whitewash over a broad extent of surface with excellent results. Sprinkled dry over floors and pavements, and after a day or two washed off with water, it cleanses and deodorizes most effectually.

The use of free gaseous chlorine is also very effective. Where this is used it requires to be slowly but continuously liberated until the desired effect is obtained, limiting the quantities so as not to irritate the air passages of the inmates occupying the apartments. The best method for obtaining this result is to rub together equal parts of common salt and binoxide of manganese, and to 200 grains of this mixture, placed in an earthenware vessel, add half a fluid ounce of sulphuric acid, previously diluted in the proportion of two parts of acid to one of water by measure, which should be allowed to cool before using. This mixture is to be well stirred and placed under the bed or elsewhere on the floor of the sick chamber, when chlorine gas is slowly eliminated, this quantity giving off about fifty cubic inches within twenty-four hours, which, when thus gradually diffused through a room containing sixty cubic feet of air, is said to cause no irritation or discomfort. This mixture was very extensively used in the United States hospitals during the war, and is still used with the best results, the quantity named being placed under each alternate bed every night during the period of disinfection. Chlorine controlled in such a manner as this is one of the most convenient, manageable, and effective disinfectants, and on the basis given may be adapted to rooms or wards of any size by varying the quantities of the ingredients. The chemical reactions by which the chlorine is set free result in the formation of sulphate of soda and sulphate of manganese, with excess of sulphuric acid, all of which are also disinfectants, and well adapted to correct the fetor and destroy the poison of excretions. In epidemics of cholera and other contagious diseases it has been used with good results.

Solution of chloride of zinc is an excellent odourless, antiseptic, and disinfecting fluid, known in commerce as Burnett's Disinfecting Solution. Diluted with water and poured into closets or drains it speedily destroys foul odours. It may be easily prepared by dissolving scraps of sheet zinc in muriatic acid and diluting the solution with water, or by dissolving four ounces of sulphate of zinc and two ounces of common salt in a gallon of water. A solution of chloride of aluminum, under the name of chloralum, is also much used for the same purposes. This may be economically made by dissolving four ounces of alum and two ounces of chloride of calcium in a gallon of water. Allow the precipitate which forms to settle, and pour off the clear fluid, which will then be ready for use.

Chloride of lead in solution is also effectual as a deodorizer and disinfectant. In the very useful pamphlet issued by the Provincial Board of Health, giving instructions how to check the spread of contagious and infectious diseases, the following formula for this solution is given: Dissolve two drachms of nitrate of lead in a quart of water, and in a larger vessel containing a gallon of water dissolve two tablespoonfuls of common

salt (chloride of sodium), mix the solutions and store for daily use. "Since one part of chloride of lead is soluble in 105 parts of water, this preparation may, if desired, be made twice or four times the strength here given, and, no doubt, the stronger solution would be more effectual for many purposes. Made after the formula referred to the cost would not exceed two cents per gallon. All these solutions are adapted for disinfecting discharges, cleansing linen and vessels in the sick chamber; they are also used for deodorizing the atmosphere by hanging cloths wet with them about the room.

Bromine is a powerful disinfectant, oxidizing decaying organic matter very rapidly, but its vapours are exceedingly irritating, and hence it is necessary to exercise care in using it. It is a liquid of a deep red colour, and a weak solution in alcohol, about ten drops to the ounce, is strong enough for use. A little of this mixture may be poured on a plate or saucer and allowed to evaporate spontaneously, and the operation repeated as often as is necessary to keep the atmosphere of the room charged with it up to that point where its presence will be perceptible to the nose, but not unpleasantly irritating to the nostrils or throat.

Iodine is very much like bromine in its action, but, being a solid which slowly volatilizes at ordinary temperatures, may be used by putting it in a wide-mouth bottle, and leaving the stopper out long enough from time to time to impregnate the atmosphere with its vapour. It is not so irritating as bromine.

For deodorizing or disinfecting the air of a sick chamber the use of ozone has been found one of the most efficient and least objectionable agents. This gas is regarded by chemists as a modification of oxygen, three volumes of oxygen being condensed into two to form ozone. It is a colourless gas of a peculiar odour, somewhat resembling chlorine, and is one of the most powerful oxidizing agents known. It is given off with considerable regularity when a stick of phosphorus about three or four inches long is laid upon the surface of a plate or saucer and immersed in water, leaving about one-third of its surface exposed to the air. Should the odour of phosphorous acid at any time become disagreeable in the room more water should be added, and where the apartment is small, or at night, when it is closed and still, a mere line of the cylinder of phosphorus exposed above the surface will be sufficient. There are, however, some objections to the use of this substance. In the darkness the exposed portion of the phosphorus shines, casting a faint light around the apartment. The vapours arising from it are also faintly luminous; these appearances should be hidden from the patient, or they are apt to induce restlessness. Phosphorus is also very inflammable, and any accident whereby it may be allowed to become dry would result in its spontaneous combustion, and unless it was at once subdued by submergence in water it would set fire to anything near it; yet with proper caution this disinfectant may be used in many cases with advantage.

The use of sulphurous acid gas as a disinfectant is of great antiquity. It is produced when sulphur is burnt—when one atom of the sulphur unites with two of oxygen. It is a powerful deoxidizing agent, but on account of its irritating qualities it cannot be used in rooms which are occupied, but is very useful for fumigating empty rooms or houses which have become foul from any cause.

Wood smoke is also useful for the same purpose; indeed there are few more effective agencies than this when diffused by the heat of the fire by which it is produced. This smoke carries carbon, creosote, pyroligneous acid, carbonic acid and oxide, with watery vapour enough to dissolve or suspend them, and with heat enough to secure their rapid diffusion until condensed by contact with the cooler surfaces. Every part of the air space is thus invaded and every surface receives its share of the condensed products. A good smoking, followed by a good whitewashing, is thoroughly disinfectant.

Carbolic acid is a very useful disinfectant, having the property of promptly arresting the progress of decomposition. It may be used dissolved in from twenty to forty parts of water and sprinkled on the floors of the rooms it is desired to disinfect, or the solution may be distributed through the air in the form of vapor by an atomizer. Uncertain and variable compounds of crude carbolic acid mixed with lime are frequently sold under the name of carbolate of lime, but their action is doubtful, and it is far better to use carbolic acid in its purer forms, and mix it with fresh, air-slacked lime where such an addition is desirable.

Recent experiments on an extended scale in Germany have established the great value of bichloride of mercury (corrosive sublimate) as a disinfectant, placing it in the front rank, if not in advance of all other substances used for this purpose. From the experiments of Erismann this salt in solution ranks first as a deodorizer of excrementitious matter, sulphate of iron or green copperas in solution ranking next in value. As a destroyer of disease germs it is claimed in Koch's report on his researches on disinfectants to be far in advance of all other substances in value for this purpose. He experimented on the resting spores of bacilli, and estimates the relative value of disinfectants in infectious diseases by their capability of destroying these spores. The resting spores of splenic fever were generally employed in his experiments. He found that carbolic acid, sulphurous acid, chloride of zinc, and many other substances which have been recommended for this purpose, are not always to be relied on, and that the only certain disinfectants for infectious diseases are chlorine and bichloride of mercury. Bromine and chlorine are recommended for confined spaces, but in all cases where neither gases nor heat are available, this salt of mercury is recommended. A solution of one part in one thousand (equal to one ounce in about eight wine gallons of water) killed the resting spores in ten minutes, and, indeed, simple moistening of the earth containing the spores with this solution is sufficient to arrest their power of development.

Sulphate of iron, known also as green copperas, dissolved in water, is an effectual deodorizer. A five per cent. solution, equal to about six ounces to the wine gallon, is strong enough for most purposes, and may be applied freely to decomposing material wherever it is met with.

Quicklime is a very serviceable disinfectant, and may be used in many places and under many circumstances where other disinfectants would be inapplicable. In damp underground apartments or alley-ways, in cess-pools and sewer traps, and in most other insalubrious places not accessible to copious washing or other cleansing processes, nothing is more effective than quicklime. A dark, damp, mouldy, ill-smelling room, may be rendered comparatively sweet by keeping in it a bucket full of lump lime, and renewing this from time to time as it falls to powder. As an absorbent of aqueous vapor, it is unrivalled, and when it is remembered that the aqueous vapor of the atmosphere is the great solvent and vehicle for carrying noxious effluvia and decomposing organic matter, it will be easy to comprehend the usefulness of lime. Its affinity for water, for carbonic acid, for sulphur compounds, and for acids in general, its caustic nature whereby it is destructive to the lower orders of organic life, and its slow solubility, by which its action is rendered persistent and durable, all conspire to make it a most useful substance.

Another disinfecting agent, somewhat similar in character, and as important, is common wood charcoal. It is a wonderful absorbent of almost all the offensive and noxious gases, packing them away in its pores in some inexplicable manner, so that it is capable of taking up and retaining, under favourable circumstances, from twenty to fifty times its volume of some gases, and partial, or even entire, saturation with one gas does not prevent the absorption to a considerable extent of others. But it is not only as an absorbent that charcoal performs its disinfectant functions, it has the power of inducing chemical action and of oxidizing by means of the oxygen stored within its pores. Thus sulphuretted hydrogen absorbed by charcoal has its hydrogen at once seized by the oxygen and converted into water, whilst the sulphur is precipitated into a harmless condition, or oxidized into sulphurous or sulphuric acids. Carburetted hydrogen is decomposed and oxidized into carbonic acid and water, and such reactions appear to continue by fresh accessions of oxygen from the air without, until the limit of the capacity of the charcoal for the gases and mixed products is reached, when by re-heating, its absorbent powers may be renewed. Charcoal, for sanitary purposes, should be recently burned and ground to a moderately fine powder and be kept until wanted for use where it will be least exposed to air and moisture.

Permanganate of potash in solution is an efficient antiseptic, and when mixed with material evolving offensive odors promptly corrects them—it does not, however, affect effluvia existing in the air only so far as it is brought into immediate contact with the

solution. Frequently by its use odors may be corrected at their source, which have rendered chambers or even entire dwelling houses offensive.

Many other salts of the metals and alkalies have been recommended as disinfectants, such as the nitrates of lead, zinc, mercury and iron, chloride of iron, sulphate and hyposulphite of soda, etc., but in the list which has been more prominently brought before you, there are included all the more important articles, and those which have been most extensively tested. Camphor and some volatile oils have also been recommended for this purpose, but these rather mask and disguise noxious effluvia than destroy them.

This paper would be incomplete without reference to one other most important agent, that is, heat. This in efficacy and universality of application may be regarded as one of the greatest disinfectants. The cold of a freezing temperature renders the process and material involved in the production of spasmodic diseases latent, and occasionally a thorough disinfection appears to have resulted from the use of ice; still it is doubtful whether the effect of cold ever does more than suspend the activity of the causes of infection. The salutary and permanent effect of heat, however, is undoubted. A temperature of 150° is said to be sufficient to destroy the insects and ova of the pediculus and acarus affections, whilst 200° is required for the destruction of the germs of scarlatina, but since few of the articles in common use are injured by a boiling temperature, 212, it is better to adopt this, whether the heat be used dry or moist, as the lower limit of safety. Steam may in many cases be more effective than boiling water, and dry heat may in some instances be used to produce higher temperatures with the advantage of greater security.

Infectious Diseases in Schools.

(By Dr. Cl. T. Campbell, London.)

A great number of diseases—and these among the most virulent that afflict humanity—are communicated from one person to another; in some cases by direct contact of the individuals, in some by inoculation with the poison of the disease, in others simply by inhaling the air which has been infected. In some cases it is necessary to come into close proximity with a diseased person in order to be injuriously affected; in others the poison may be conveyed long distances in the clothing of healthy people who have come in contact with the sick person, even in letters that have been written or books and other articles that have been handled by the patient.

Among these diseases are: Small-pox, Scarlet Fever, Diphtheria, Measles, Whooping-cough, Erysipelas, Typhoid Fever, Yellow Fever, Hydrophobia, Cholera, Consumption, some skin diseases, and possibly others. They are not all of equal virulence, nor are they all communicable with equal facility. In fact, with some the probabilities of infection in any given case are so slight that many physicians would declare no danger existed whatever.

I do not purpose discussing the nature of these diseases nor the character of the poison which they generate, nor their medical management. Sanitary science deals mainly with the prevention of disease, and this comes more within the scope of our work in the present convention. The extent to which these diseases originate *de novo* might be a subject for discussion. But there is no doubt that, with regard to some of them, they are scarcely ever seen except as the result of communication. Consequently, for these, preventive measures are largely confined to protecting the healthy person from contact with the diseased.

It is at public gatherings—in churches and schools—wherever people assemble in numbers—that these diseases are largely propagated; and in none more so than in schools. Of course, our schools being public institutions, and directly under the public control, ought to be well protected, but the experience of physicians shows that too often they have been fruitful sources of infection, spreading disease throughout an entire community. Let us consider for a moment or two what steps should be taken for the protection of the

school children, and the families to which they belong, from the spread of communicable diseases.

I say nothing here of the duty resting on the teacher to see that his school is kept clean and wholesome, and that it is as thoroughly ventilated, warmed and lighted as circumstances will allow. This applies at all times, and under all conditions, irrespective of the presence of disease in the locality. Impure air is a cause of disease; it stimulates and propagates disease; and it is certain that the best plan we could adopt to spread disease, whether contagious or not, would be to leave the school-room foul. But, aside from this, the teacher, it should be remembered, is a public officer, who is vested by law with certain powers which he can exercise, and should exercise, in the interests of his school. Among these is the power, and the duty as well, "to see that no pupil is admitted to, or continues in, any of the public schools, who is afflicted with, or has been exposed to, any contagious disease, until all danger of contagion from such, or from the disease or exposure, shall have passed away, as certified in writing by a medical man." The teacher is thus a sanitary officer, with large powers and proportionate responsibilities. How carefully he should watch for indications of approaching disease, not simply in the school, but in the neighbourhood! If he hears of a case of scarlet fever, diphtheria, or any other communicable disease, in his section, he should endeavour to find out if the patient is one of his scholars, or if any of his scholars reside in the house with the patient or adjacent to it. If a scholar is absent through sickness, he should find out, if possible, the nature of the disease, and thus learn if it is of the class that requires him to exercise precaution to prevent its affecting his charge. If a scholar appears with an eruption on the skin, he should be promptly dismissed from school until the most satisfactory evidence is obtained that there is nothing contagious about the disease. And in every way the teacher should be watchful and prompt to protect his pupils from dangers of this description.

If the provisions of the Public Health Act were properly carried out, the teacher would be greatly assisted in the sanitary watch-care of his school; for it is by law the duty of every person in whose house there is a case of any infectious or contagious disease, and of every physician attending such a case, to report it at once to the Health Officer of the locality; and if this were done the teacher would obtain early information of the presence of these diseases, and would be enabled to take the necessary precautions. Unfortunately, in many localities there are no health officers whatever, either in fact or in name, and not much assistance can be obtained from this source. Under a more perfect system of public sanitation, the Municipal Health Officer would know the very day a case of communicable disease might appear in his jurisdiction, and teacher and sanitarian could be mutually helpful.

The diseases against which special precautions must be taken in our schools are Small-pox, Scarlet Fever, Diphtheria, Measles, Whooping-cough, Mumps and Chicken-pox, among acute diseases. The only chronic diseases needing attention are certain skin affections of a parasitic origin, such as Itch and presumably eruptive diseases of the scalp, Favus, Ringworm, etc. Now, while there is a general regulation requiring the exclusion of children suffering from, or exposed to, contagious diseases, it does not follow that one rule should apply to all, or that all such diseases need equally strict measures of quarantine. For example, if there is typhoid fever in a house, it is not necessary to exclude from school all the children residing in this house; but it would be necessary if the disease were scarlet fever.

There can be no doubt that the general law, if faithfully carried out, would be of very great service. But I think it is certain that greater efficacy will be secured by having some definite rules. A general principle cannot always be so thoroughly nor so easily enforced as particular restrictions. Besides, as I have already intimated, the degree of isolation necessary to prevent the spread of infection varies with different diseases. It is true, the general regulation requiring a medical certificate to the effect that there is no longer danger of infection, might be supposed sufficient, and ordinarily it would be so. But physicians might differ—and do differ—as to when the time of safety from infection in any given case had arrived; and occasionally, for physicians are only human, one might be a little careless in giving a certificate in a matter which, on account of specially

favourable circumstances, might seem of little importance, but which might eventually prove of very great importance.

It would would seem advisable, therefore, that Boards of Trustees should supplement the general regulation by adopting some specific rules which would distinguish between diseases of varying degrees of virulence, and which should fix certain periods during which pupils exposed to these diseases, or attacked by them, should be excluded from the schools.

In cities where there is a proper sanitary organization, every house in which there is a contagious disease is placarded with its name; and in such cities the time when the placard is removed from the house by the municipal authorities gives a definite date upon which to base the period of exclusion from school. But as there are no municipalities in this section of the country where there is any such system, we have only to take the time of the patient's recovery, as certified by a physician. With regard to the milder diseases, such as chicken-pox, mumps, whooping-cough (though this is not always a mild disease by any means), it may be sufficient to exclude the patient from school until complete recovery. The same rule might apply to eruptive diseases of the scalp, to itch or to any skin disease of a parasitic origin. In measles, diphtheria, scarlet fever and small-pox, not only should the patient be excluded from the school until from ten to twenty days after recovery, but all the residents of the house where the disease exists should be excluded for a time. In regard to small-pox the wisest plan would be to require evidence of effective vaccination before admitting any pupil to the public schools. But it is the opinion of some legal authorities that School Boards have not the power to enforce any such rule. If that opinion be correct, then the next best thing would be to come as near compulsory vaccination as we can; and whenever a case of small-pox occurs in a school section, to exclude all unvaccinated children resident within a certain distance from the infected house. If, therefore, any Board hesitates to adopt the more restrictive and more effective rule, there is no reason why the milder one, which I have incorporated in these rules, should not be adopted.

By way of practical summary, I conclude with a set of rules that, while possibly not the best, will yet be found of material advantage in preventing the spread of communicable diseases in our schools. With some slight modifications, they are in force in the schools of London. They are based on the general law which I have already quoted in the School Regulations, Chapter 11, Sec 3. And these, or others better than these, should be adopted by every Board of Trustees, and faithfully enforced by every teacher:

1. *Small-pox.*—All pupils residing within 250 yards of any house where small-pox exists, will be excluded from the schools until they produce a physician's certificate of effectual vaccination. All pupils residing or visiting in any house where small-pox exists, or within twenty yards of such house, will be excluded until twenty days after the recovery of the patient.

2. *Scarlet Fever.*—All pupils coming from any house where scarlet fever exists, will be excluded until twenty days after the recovery of the patient; except children who have previously had the disease, who will be excluded until ten days after the recovery of the patient.

3. *Diphtheria.*—All pupils coming from any house where diphtheria exists, will be excluded until ten days after the recovery of the patient.

4. *Measles.*—All pupils coming from any house where measles exists, will be excluded until the recovery of the patient; the patient will be excluded until ten days after recovery.

5. *Other Diseases.*—All pupils afflicted with mumps, whooping-cough, chicken-pox, or any eruptive disease of the scalp, will be excluded until complete recovery.

6. The evidence in regard to time of recovery from any of the above mentioned diseases will be a physician's certificate.

7. In excluding pupils from any house in which small-pox, scarlet fever, diphtheria or measles exists, two or more dwellings must be considered as one house if there is any direct communication between them; any opening from one into the other; if it is possible to enter or leave the two residences by means of the same hall, stairway or door, or if the rear yards are used in common.

8. Whenever it comes to the knowledge of a teacher that a pupil has visited a house where small-pox, scarlet fever or diphtheria exists, or has attended the funeral of any person dying of these diseases, such pupil shall be at once excluded from the school and the case investigated by the teacher, who shall then decide whether or not the pupil shall be excluded for the full period required by these rules. (In cities the case may be referred to the Inspector for investigation and decision.)

9. Whenever the teacher has reason to believe that any pupil has been afflicted with, or exposed to, any disease not specially referred to in the above rules, which may render such pupil a source of infection or contagion, he will exclude the pupil until he has received satisfactory evidence that all danger has passed away.

The Prevention of Infectious Diseases.

(By Dr. O. W. Wight, Health Officer of Detroit, Mich.)

In response to the earnest solicitation of the distinguished Chairman of the Provincial Board of Health, I have prepared a paper for this meeting with as much care as the ceaseless toil of my administrative sanitary duties would permit. If I report some things written, used, and published elsewhere, the matter will be new here, and all the better because the result of more attention and labour than could now be spared.

Among the many topics of hygienic importance that might be considered, I select "The Prevention of Infectious Diseases" as one especially needing public discussion. In a service of nearly six years I have introduced, and successfully carried out, an effective system of restricting the diffusion of contagious diseases, and may be permitted to give here the results of my experience.

Of course, the vast question of epidemics: their origin, history, characteristics, amenability to improved sanitary conditions resulting from the advancement of material civilization, and partial control by therapeutical agents furnished by science, cannot here be discussed. We must confine ourselves to existing phenomena, and look at the problem of arresting some of the ravages of infection from a hygienic point of view. And even within this restricted field we must more especially consider the province of state medicine.

John Simon, the prince of English sanitarians, very clearly and graphically describes the ways in which the infectious diseases are spread through modern communities and become epidemic. He very sensibly confines himself to facts, and avoids telluric and other theories of epidemicity.

"The social conditions," says Mr. Simon, "through which the more fatal infectious diseases are enabled to acquire *epidemic diffusion* are chiefly such as the following:—That persons first sick in families and districts, instead of being isolated from the healthy, and treated with special regard to their powers of spreading infection, are often left to take their chance in all such respects; so that, especially in poor neighbourhoods, where houses are often in several holdings, and where always there is much intermingling of population, a first case, if not at once removed to a special establishment, will almost of necessity give occasion to many other cases to follow; that persons with infectious disease, more especially in cases of slight or incipient attack, and of incomplete recovery, mingle freely with others in work-places and amusement-places of common resort, and, if children, especially in day-schools; and that such persons travel freely with other persons from place to place in public conveyances; that often, on occasions when boarding-schools have infectious disease getting the ascendant in them, the schools are broken up for the time, and scholars, incubating or perhaps beginning to show infection, are sent away to their respective, perhaps distant, homes; that keepers of lodging-houses often receive lodgers into rooms and beds which have recently been occupied by persons with infectious disease and have not been disinfected; that persons in various branches of business relating to dress (male and female) and to furniture, if they happen to have infectious disease, such as Scarlatina or Smallpox, on their premises, probably often

spread infection to their customers by previous carelessness as to the articles which they send home to them; and that laundries further illustrate this sort of danger by carelessness in regard to infected things which they receive to wash; that purveyors of certain sorts of food, if they happen to have infectious disease on their premises, by carelessness spread infection to their customers; that streams and wells with sewage and other filth escaping into them are most dangerous means of infection, especially as regards Enteric Fever and Cholera; and that great purveyors of public water-supplies, so far as they use insufficient precautions to ensure the freedom of their water from such risks of infectious pollution, represent in this respect an enormous public danger; that ill-conditioned sewers and house-drains, and cess-pools receiving infectious matters, greatly contribute to disseminate contagia, often into houses in the same system of drainage, and often by leakage into wells. Of the dangers here enumerated, there is perhaps none against which the law does not purport in some degree to provide. At present, however, they all are, to an immense extent, left in uncontrolled operation; partly because the law is inadequate, and partly because local administrators of the law often give little care to the matter; but chiefly because that strong influence of national opinion, which controls both law and administration, cannot really be effective until the time when a right knowledge of the subject shall be generally distributed among the people, and when the masses, whom epidemics affect, shall appreciate their own great interest in preventing them."—*Quain's Dictionary of Medicine, p. 293.*

The most potent instrumentality for the diffusion of sanitary information among the people, so earnestly desired by Mr. Simon and, I may add, by all other enlightened sanitarians, is the newspaper. In most places the secular press has performed a service in this respect for which all public health authorities are grateful. Now and then, however, we find a sad exception to the good rule, when some journal makes an *ad captandum* appeal to ignorance, prejudice, obstructive interest or perversity, against the enactment or administration of sanitary law needed for the public protection. Such an appeal deserves rebuke, and the fallacy of arguments used should be unsparingly exposed.

Not long ago I saw in a widely-circulated London journal the following:—"We have not yet reached the period in which human beings, who are criminal enough to fall ill of an infectious disease, will be despatched as summarily as cattle infected with Rinderpest, but we are travelling thither at such a rate as even to alarm not a few of the medical profession."

There is no Act of Parliament, none has been proposed, none is likely to be proposed, which can be construed, by any logical torture, as an advance in the direction of treating disease as a crime. Such a declaration is exactly the false major premise on which the argument of the journalist rests. Conclusions antagonistic to English liberty, are fallaciously drawn from such a constructive misstatement.

While, for obvious reasons, a man is not punishable for being sick of a contagious disease in his own house, while his friends are not guilty of crime in declining to remove him, yet, if the man thus sick goes out into the public way, carrying with him his infection, or if one takes out an infected child or other dependent person, this act, at the Common Law, subjects the doer to an indictment. (Rex. *v.* Vantandillo, 4 M. L. and S. 73; 1 East P. C. 226.) Thus the Common Law, founded in the eternal principles of justice, on which English liberty in great measure rests, very properly treats exposure of others to sickness or death from infectious disease as criminal. Conceal infection in your house and allow others unwittingly to enter, and you become thereby, under long-established British law, a punishable public malefactor. The doctor who helps you conceal it is clearly a *particeps criminis.* The professional oath requires no man to take part in the violation of law.

The measures which are fictitiously combatted are not directed against the unfortunate who is sick of a contagious disease, but against the common law crime of spreading it. The argument of the London journal is precisely a plea for liberty to scatter infection. It is not very noble to die, or even to contend for that kind of liberty. The argument denies to the public the right and the sacred liberty to protect itself against contagious disease. It combats the ancient and precious legal maxim: *Salus populi est suprema lex.* The journal in question says: "Hitherto Englishmen have preferred to take their chance

of death and disease rather than submit to such restraints;" meaning, in the journal's logic, restraints against giving deadly infection to their neighbours. "If they bow their necks to the yoke," continues the journal, "it will be among other signs that the popular estimate of the comparative importance of liberty is no longer so high as it used to be." If Englishmen ever prized the liberty to communicate small-pox to other Englishmen, the decadence of such liberty is a happy sign of advancing civilization. What should we think of a claim made in the name of English liberty for lepers to run at large in a great city under the sophistical plea that imposing "restraints" on them would be "treating disease as a crime?" Yet many more die of small-pox than of leprosy, and many more of typhoid fever, scarlatina or diphtheria than of small-pox.

Again, Mr. Simon, whom no one can charge with sensationalism or want of enlightened judgment, has pointed out with incisive good sense and ample practical knowledge, the proper remedy for an appalling public evil. In this matter, as in many others, the legitimate boundary between the realm of personal liberty and the realm of duty owed to the community must be carefully traced and scrupulously followed.

"Whenever the time shall come," says Mr. Simon, "probably the public good will be seen to require, with regard to every serious infectious disease which is apt to become epidemic, that the *principles* which ought to be accepted in a really practical sense, and to be embodied in effective *law*, are somewhat as follows: (1) That each case of such disease is a public danger, against which the public, as represented by its local sanitary authorities, is entitled to be warned by proper information; (2) that every man who in his own person, or in that of any one under his charge, is the subject of such disease, or is in control of circumstances relating to it, is, in common duty towards his neighbors, bound to take every care which he can against the spreading of the infection; that so far as he would not of his own accord do this duty, his neighbors ought to have ample and ready means of compelling him; and that he should be responsible for giving to the local sanitary authority proper notification of his case, in order that the authority may, as far as needful, satisfy itself as to the sufficiency of his precautions; (3) that so far as he may from ignorance not understand the scope of his precautionary duties, or may from poverty or other circumstances be unable to fulfil them, the common interest is to give him liberally out of the common stock such guidance and such effectual help as may be wanting; (4) that so far as he is voluntarily in default of his duty, he should not only be punishable by penalty as for an act of nuisance, but should be liable to pay pecuniary damages for whatever harm he occasions to others; (5) that the various commercial undertakings which in certain contingencies may be specially instrumental in the spreading of infection; water companies, dairies, laundries, boarding-schools, lodging-houses, inns, etc., should respectively be subject to special rule and visitation in regard of the special dangers which they may occasion; and that the persons in authority in them should be held to a strict account for whatever injury may be caused through neglect of rule; (6) finally, that every local sanitary authority should always have at command, for the use of its district, such hospital accommodation for the sick, such means for their conveyance, such mortuary, such disinfection establishments, and generally such planned arrangements and skilled service as may, in case of need, suffice for all probable requirements of the district." (*Quain's Dictionary of Medicine, p. 293.*)

In Detroit we have a system founded upon the principles of isolation and disinfection. Whenever any person is taken sick with a contagious disease the attending physician is obliged by law to report the case to the health officer. The householder is also obliged to report it. In practice, the health officer is satisfied if the report comes from either the householder or the physician. A recent statute of Michigan enumerates small-pox, scarlet fever, diphtheria, and Asiatic cholera, as among the contagious diseases to be thus reported. This law was found necessary inasmuch as in some of the towns the State physicians would testify before juries that diphtheria especially, and sometimes that even scarlatina, is not contagious. That loop-hole for evading a wholesome regulation is now effectively closed.

As soon as a case is reported record is made of it, and a police officer is sent to placard the house. The same officer delivers to the family a circular from the health department, giving full instructions for the hygienic management of the disease, and also

giving full information as to sanitary regulations to be observed. In a case of small-pox, the members of the household and the neighbors are vaccinated. Sometimes the case is removed to hospital, when provisions for proper and safe care cannot be made at home.

When the citizen has his house placarded, he announces thereby to all comers that infection is within, and is shielded from any liability under the common law for concealing the disease and exposing others. The physician reporting the case is protected by such act from any charge of complicity, and is not subject to the grave moral accusation of conniving at the spread of infectious disease, for the purpose of increasing his practice.

The next thing done by the Health Department is to give information of the case to schools, which are required to exclude all children from the infected house. The exposed inmates of the house are excluded from workshops, and other places where their occupations would require them to mingle with others. The needy are supplied with fuel, food and attendance. When the case terminates, a skilled officer from the Health Department is sent to disinfect the premises, and then the quarantine is removed. If the patient dies, a public funeral is prohibited, and young people are forbidden to act as pall-bearers at the private funeral. The remains of persons deceased of infectious diseases cannot be brought to, nor removed from the city, except under the strictest regulations of enclosing in metallic coffins, etc., ensuring safety to the public. Undertakers are strictly forbidden to take an infected corpse into a church, or other public place, or to open the coffin for view of the deceased at a private funeral.

Houses where infectious diseases have been, are inspected, in order to ascertain any sanitary defects. Such inspection not unfrequently results in an order to abate nuisance.

There is no fact better established than this, to wit, that all epidemic diseases are increased in virulence by conditions of filth and unwholesome habits of life. While the public health authority can do very little in regard to the manner of living among the people, it can do a great deal in the way of removing and preventing unsanitary conditions. All effort in that direction tends to destroy the food on which epidemic diseases feed. The channels through which contagious germs travel from person to person are numerous, and therefore the work of the health authority cannot well be too comprehensive.

Isolation and disinfection, together with vaccination as preventive of small-pox, constitute the fundamental principles of the method. The aim is to prevent as far as possible exposure of the non-infected to the infected, to close up the channels through which contagion is conveyed from the sick to the well, and to destroy accumulations of disease germs whenever they can be reached.

So far as the public sanitary agency is concerned, contagious and infectious diseases may be divided into two classes: (*a*) those that may be allowed to run their course, under the exclusive management of the family and the physician; and (*b*) those that should be combated under regulations provided by law to prevent their spread. In the first class may be reckoned chicken-pox, mild measles, whooping-cough, etc. In the second class may be reckoned small-pox, scarlet fever, diphtheria, typhus fever, enteric fever, cholera, etc. It is not often that we have all the graver contagious and infectious diseases prevailing at the same time.

Some infectious diseases require to be regarded in the first or second class, according to the type of a prevailing epidemic. Sometimes a malignant form of measles prevails, when, for a period, it would be necessary to apply all the machinery of repression. Ordinarily, measles are not very dangerous, and as the disease is inevitable sooner or later, and is less fatal in childhood than in advanced age, it is better to let it take its course. When scarlatina is of a very mild type, it would be as well to let it run, but for the very important fact that susceptibility and danger rapidly decrease after the first dozen or fifteen years of life. Enteric fever also becomes rarer and rarer after thirty years of age, and does not exist at all after forty-five or fifty. As one attack does not exempt from future attacks of diphtheria, the disease is always to be combated. It is not easy to decide when, and to what extent, the health authority should interfere in the execution of measures to suppress communicable diseases. In all cases, private and public effort should be intelligently combined in struggling against these foes of mankind. And sanitary officers should always be clothed with authority, expressed or implied, to use

discretion in the enforcement of measures for preventing the spread of contagious and infectious diseases.

The Advantages of the System may be Briefly Stated.

1. It enables the Health Department, and the public through the Health Department, to know every day in the year the exact number of cases of infectious diseases in the community and their precise location. Rumor and sensational exaggeration in regard to the prevalence of contagious maladies, which are liable to alarm the people needlessly and to interfere with the pursuits of life, can then be corrected by facts. And the truth of a violent epidemic cannot be suppressed in the interest of commerce to the criminal endangering of the outside world.

2. The exact percentage of mortality is constantly known, revealing the severity or mildness of an epidemic.

3. The system affords especial means of studying the conditions under which contagious diseases flourish, or to what extent they are influenced by sanitary surroundings.

4. It diminishes the spread of contagious diseases by protecting large congregations of children in schools from the presence of those bearing infection in their persons or clothes; by preventing exposure of the living at public funerals; by revealing to all who can see and read the places where such diseases can be caught, and by destroying the lingering germs of contagion in sick rooms by means of thorough disinfection. My experience convinces me that a community will give a wide berth to small-pox, scarlet fever or diphtheria if you will only let them know where it is. I have frequently seen quite small children cross over to the other side of the street when approaching a house on the door of which was placed a placard revealing the existence of contagious disease within. It is wicked to conceal from God's little ones the fountains of infectious suffering and death.

The Difficulties of Carrying Out the System are Considerable, but not Insuperable.

1. While the majority of educated physicians are ready to co-operate with the health authority in carrying out any reasonable system of protecting the public from contagious diseases, the negligence of some and the perversity of a few must be overcome by the unflinching execution of the law. The medical practitioner depends upon the patronage of the public, and should be willing to do for the public at large a service that costs very little time and trouble, and is attended with no expense. The necessity of reporting to the Health Office all deaths, with the causes, in order to get a permit to bury, puts the doctor on his good behaviour. A few attempts to return croup for diphtheria, spotted fever for scarlatina, etc., may be met with an order for a coroner's inquest. Inability to make a diagnosis is sometimes urged as an excuse by delinquent quacks, but an unmistakable indication of criminal prosecution soon reveals to them that the responsibilities of assumed knowledge cannot be voided by a plea of ignorance. In some instances doctors will prematurely report recovery. The law of duration in contagious diseases is too well known to allow such heedlessness to escape notice and rebuke. It is sometimes disagreeable to supplement the mental and moral defects of a portion of the profession by the terrors of criminal law, but faithful sanitary administration requires it.

2. At first the people objected to having their houses placarded, as a violation of personal liberty. A little argument convinced reasonable citizens that no man has the natural or acquired right to expose his neighbours to deadly contagious disease by concealing it in his own house. Personal liberty to give small-pox to somebody else had better be abridged as soon as possible. Personal liberty to send scarlet fever into a school with your child is rather diabolical than beneficent. Personal liberty to infect a church with a diphtheria corpse is tempting Providence to start an epidemic. A law-abiding community submitted, and to-day the system of placarding, if it were left to an election, would receive a majority of votes in its favour. Experience proves its value in many ways to the citizen. He knows and feels that, by reason of it, his family is more secure against diseases that cost money, anxiety and sorrow.

The Defects of the System are Already Apparent to Educated Sanitarians.

1. So far as small-pox is concerned, proper vaccination and re-vaccination at suitable ages should be universal and compulsory. Without vaccination suppression of the disease allows the greater accumulation of material for the conflagration of an epidemic that sooner or later may get under way and defy all control.

2. The efficiency of the system depends to a great extent on the willing or enforced co-operation of the medical profession. Just so far as the profession falls short of an ideal standard must the system fail to reach an ideal value, however well it may be administered.

The system should be supplemented by hospitals, to which the sick with contagious diseases, who have no homes, can be taken. With an efficient system of placarding and isolation, it is more economic, more humane, if not safer, to leave patients who have homes under the care of their families and friends. However excellent an hospital and its service may be, households are unwilling to give up any of their sick members to be nursed by unknown hands in a strange place. To force away children from parents, from brothers and sisters, and parents from children and from one another, for the purpose of isolating infectious disease, exposes the public by transportation of the afflicted, diminishes the chances of recovery, outrages the unreasoning affections, and invades the sanctity of home. Sanitation must reckon with the unalterable instincts of humanity and restrain itself within the boundaries of reasonable endeavour.

Therefore, in my judgment, the isolation of contagious and infections diseases in the family, which is the unit of our political society and Christian civilization, is wisest and best. After long administrative training we shall get the willing co-operation of households and their chosen physicians. The day will come when exposure of others to our diseases will be recognized as a crime, the punishment of which will be demanded by the public conscience.

In the meantime we must combat superstition, diffuse rational knowledge, and protect the people against pestilence by the simplest and most effective means at our command, winning confidence by patient, kindly instruction, only using repression and the lash of the law when we must.

For the prevention of infectious diseases we are sadly in need of intelligent and trained private endeavour, as a supplement to public sanitation. Would that the clergy, taking for texts the hygienic precepts of Moses, which have not been surpassed by the revelations of modern science, might preach the Gospel of cleanliness and thus open up to their people new avenues of godliness! Would that we had in every city a society of devoted men and women, like the order of the Red Cross, whose especial duty it should be to go into the by-ways, not far from their own doors, and save from the perils of contagion and filth a greater number who perish, year by year, in times of peace than ever die on the fields of battle in times of war!

"Sanitary Condition of Rural Schools."

(By J. Dearness, Esq., Inspector of Schools, East Middlesex.)

Martial, the father of epigrammatists, crystallized a large part of the human experience of his day in the short sentence: *Non est vivere, sed valere vita*—"Life is not living, but the enjoyment of health." After the experience of seventeen centuries more, our own poet, Thomson, sung: "Health is the vital principle of bliss." No doubt the paramount importance of health to happiness will be acknowledged to the end of time. It is universally admitted to be easier to preserve health than to recover it, that health once lost is difficult or impossible to regain; yet few seem to think about preserving it until they find that they are losing or have lost it. To get and keep wealth, a hundred times as much trouble and anxiety seem to be exercised as to get and keep health; but let disease lay hold on the money-seeker, and you may see him eager to

spend his last dollar, could it but purchase that which he carelessly lost or deliberately threw away.

The life and health of the young occupy only a small portion of the attention which they deserve. A funeral cortege passed along Talbot street the other day. Some one inquired, "Whose funeral?" Reply was made, "It's only a child's." The answer does not strike one as unfamiliar. The public mourns the departure of a life whose work seems to us well-nigh accomplished; but the loss of a life of a child with all its untold possibilities is deplored only by the household. Indeed some good people talk as if they think one of the chief uses of children is to afford the Father of all Good a means of visiting on families blessing in affliction. Strange that God, while He walked on earth, manifest in the flesh, should delight in daily moving among the people, blessing the children, raising the palsied, casting out devils, and healing all manner of diseases, as was read in our hearing this morning, but, that God in heaven should look with complacency on the suffering of our little ones prostrated on beds of racking pain that they cannot understand at all, for the sole benefit of us older sinners. No; the truth taught us by statistics is that over one-fourth of all the lives God gives our race are sacrificed in early youth to the devils of sin and ignorance and uncleanliness (foul air).*

Much mischief comes from the over-estimation of the strength and hardiness of youth. On a chilly day in late September thirty children sat in an unwarmed school-room, the little girls shivering, their cheeks and lips blue with cold. A trustee of the school when told that "the stove should be put up at once or those children will get their death of cold," replied, "Oh they're young and strong; when I was like them I could stand anything." It is often in youth that the seeds of invalidism and weakness are planted, and in no other period of life is greater precaution necessary for the preservation of health. Begin to train a man when he is young to live long and well. The fallacy that the only care growing boys and girls require is to be dosed and nursed through whooping-cough and measles must be eradicated before the mission of the sanitarian is fulfilled.

I have read somewhere that infant mortality in old London has decreased by one half since mortuary statistics were first compiled. So much for the progress and benefits of sanitary science. But the high rate of mortality yet prevailing among children even in the most favoured districts and countries is a disgrace to our civilization. Nations and politicians should be keenly exercised over the frightful facts revealed by these tables of mortality. It is difficult to estimate the pecuniary value to the nation of an average life. We know that before the American war the slave dealer thought an able-bodied black worth from 1,500 to 2,000 dollars. Perhaps no one here would venture to estimate the millions of dollars lost to our country by preventable mortality; yet it would not be a long sum in addition to tell how much the Government spends annually in the only effective remedy—the diffusion of hygienic knowledge among the masses. I am a politician who believe it is the duty of our country to spend more money in preserving the lives we have and less on the importation of foreigners. Herbert Spencer truly writes: "To the tens of thousands that are killed, and the hundreds of thousands that survive with feeble constitutions, add the millions that grow up with constitutions not so strong as they should be and you will have some idea of the curse inflicted on their offspring by parents ignorant of the laws of life. Consider but for a moment that the regimen to which children are subject is hourly telling upon them to their life long injury or benefit, and you will have some idea of the enormous mischief that is almost everywhere inflicted by the thoughtless, haphazard system in common use." It is too true that few in middle life are in the enjoyment of continuous vigorous health, and could a thorough investigation be made it would most probably be found in respect to the majority of the others that the seeds of their disease or weakness were sown in childhood. How often do we see an apparently strong man succumb in the prime of life to some malady or epidemic to which others are equally exposed yet escape.

* Out of 22,208 deaths registered in the Province of Ontario in 1881, the latest year for which a report is published, 9,510 deaths, or 43 out of every 100, were of persons under 11 years of age. For the preceding five years the percentage of deaths under 11 years has varied from 39 to 44!

The immediate cause of his death is charged to the disease, but who can say that the cause of inability to resist it does not date back as far as, or further than, his school-days.

Seeing, then, that such tremendous issues hang on the right preservation of the health, and the proper development of the strength of youth, it is fitting that this convention should give earnest consideration to the subject of school hygiene, which is second in importance to only one other subject that could occupy your attention—the hygiene of the nursery.

I have endeavoured to make this paper supplementary to an able address on School Hygiene delivered by Dr. Oldright before the Provincial Teachers' Association, which I hope may be printed in the Annual Report of the Board of Health, where it would be read by many who may not see the printed proceedings of the former body.

School Hygiene naturally admits of treatment under two classes of topics, one referring to the character and conditions of the school house and its appurtenances, the other to the exercises specially designed and practised to promote the health and develop the strength of the children. It is to the former class of topics chiefly, and as rural schools particularly are affected, that I now invite your attention. These topics will be treated in the following order:

1st. Site.
2nd. Ventilation and Warming.
3rd. Water-supply.
4th. Sewerage.
5th. Furniture.
6th. Cleanliness.
7th. School age.

Site.

In rural sections where land is comparatively cheap, and choice not confined to one particular spot, there is seldom excuse for locating the school in an unwholesome or unsuitable situation. In my district, only about eight per cent. of the schools are located in unnecessary proximity to swamps or stagnant water, or on sites extremely difficult or impossible to drain properly. Very few sites contain less than half an acre, still fewer more than one acre. A site of two or three acres with ample room for wood-shed, play-shed, outhouses, rows of trees, flower plots, and a teacher's residence exists only in the dominie's dreams. Not very many of the sites are drained, and very few have suitable provision for outdoor play and exercise in wet and stormy weather. Trustees seem, in selecting a site, to bestow more attention on its elevation than on its aspect. If it costs a few dollars more to purchase a site affording a southern aspect for the school-house than one that makes the school open towards the north, they buy the cheaper. On the roads running east and west in the district, there are nearly as many houses facing the north as the south. The former are, as a rule, colder and more comfortless, with a larger consumption of fuel, and consequently greater expense therefor; and in such there are more trouble and more necessity to keep the outside porches and storm-doors in good repair. They lack the genial and health-giving influence of an open doorway filled with sunlight on the bright spring days; the front yard remains damp and muddy much longer, and the flower-beds, where such are made, are not so attractive. It is generally preferable to build the school-house near the back of the site. Then the front door opens out into the play-ground, and affords the teacher opportunity for supervision of the children during play-time; the windows are less liable to be broken than if the school-house were in the middle or front of the yard, and the boys' and the girls' private yards can be more effectually separated.

Ventilation and Warming.

The problem of ventilation is at once the most important and difficult with which school authorities have to deal. In a school favourably situated and equipped from a

sanitary point of view, the pupils—educated by the ideal teacher, intellectually, morally, æsthetically and physically—ought to grow wiser, better, happier and stronger every day. Ordinarily, the most of them do grow wiser; but do they grow stronger and healthier? In Dr. Oldright's paper, already referred to, he answers the question by simply pointing to the contrast between the appearance of the children at the close of the school-term and at the re-opening after the vacation. The same answer is given by contrasting the school at the beginning and close of winter. By parity of reasoning, you would expect to find the appearance and condition of the children more favourable in March than in June, but anyone acquainted with rural schools at least, knows that the contrary is the case. The open window suspends the rule. Why is it that in the winter season, when other people are gaining weight and vigour, school children and teachers are losing energy and appetite? The trustees and children are proud of their substantial, air-tight, comfortable brick school-house. Forty, fifty, even sixty or seventy children assemble, school is called, the day is chilly or cold, and consequently the doors and windows are all closed. How long is the air in that room fit for respiration? About ten minutes. What then? Breathe it over and over again; and so the process of devitalization and poisoning goes on and on. "But they're young; they can stand it." Recess comes and gives temporary relief. Fortunately, it is a difficult matter to keep doors shut at recesses and at noon hours.

Analysis of ordinary out-door air shows that it always contains about 4½ parts of carbonic acid in 10,000. The analyses of air made under the direction of the "Health of Towns Commission," appointed by the British Government, showed that the air in the streets of Manchester, perhaps the smokiest city in the world, contained varying proportions from 6 to 15 parts in 10,000. Other analyses furnished the following figures: a stable, 7 parts in 10,000; another stable, 14; a crowded railroad car, 34; a close bedroom in the morning, 48; a crowded lecture-room at the close of a lecture, 67; *and, worst of all, a school-room*, 72 *parts in* 10,000. Dr. A. Endemann, an analytical chemist of New York, at the direction of the Board of Health, made analyses of the air taken from several of the city schools. He certified that an examination of the air in one of the class rooms, while one of the windows was open, gave 17 parts of carbonic acid in 10,000; the window was closed ten minutes, another examination of air taken then yielded 32 parts, and he adds, "if the accumulation had been allowed to continue we might have reached within an hour the ratio of 110!" Dr. Dalton, the physiologist, says air can no longer sustain life when the proportion of carbonic acid reaches 200 parts in 10,000. Hence it is no hyperbole to say that when the proportion of carbonic acid reaches 100 parts in 10,000; *i.e.*, 1 cubic foot in 100, as probably quite frequently occurs the children and teacher are *half dead*.

But were our children living in school-rooms and sleeping-rooms, the atmosphere of which were vitiated by ten times its normal quantity of carbonic acid only, the case would not be so serious as it is. Dr. Carpenter writes that "the true poisonous agent which produced such fatalities as the Black Hole of Calcutta, and others of a like kind, is the organic matter always found in air rendered fœtid by the prolonged respiration and the cutaneous exhalations of a crowd of human beings, and the deficiency of the oxygen and the consequent increase of putrescent matter in the body." Through Mr. Alexander, of Galt, I quote from Dr. Billings, Surgeon-General of the United States Army: "The really dangerous and oppressive impurities are the organic matters thrown off in respiration, and as these increase, the carbonic acid increases in like proportion, Now the testing for these organic matters in a quantitative point of view is a very difficult and delicate process, whereas the examination for carbonic acid is comparatively simple; hence the chemical test of the quality of the air is made by the analysis for carbonic acid, which is taken as an index for the really harmful impurities existing." Prof. Leeds says, "the young active, growing brain demands the purest and the best air, and is most sensitive to foul air." Another eminent authority writes: "In all climates and under all conditions of life, the purity of the atmosphere habitually respired, is essential to the maintenance of that power of resisting disease, which, even more than the ordinary state of health, is a measure of the real vigour of the system. For owing to the extraordinary capability which the human body possesses of accommodating itself to circumstances, it

not unfrequently happens that individuals continue for years to breathe an unwholesome atmosphere without apparently suffering from it, and then when they at last succumb to some epidemic disease, their death is attributed solely to the latter, the previous preparation of their bodies for the reception and development of the zymotic poison being entirely overlooked."—*Carpenter's Physiology, page* 326.

"The poisonous effluvia which pervade the atmosphere is not only re-breathed, it adheres to all the surroundings; it sticks to the floor, wall and furniture, and permeates the clothing. Besides lessening the vital force, it predisposes to blood poisoning, and becomes a hot-bed for the reception and propagation of such poisons as scarlet fever, measles, diphtheria and a source of scrofula and consumption."—*Dr. Bell in the New York Sanitarian.*

But it is useless to multiply authorities. The effect, except in a few cases, is so far removed in point of time and circumstance from the causes, that the public cannot be alarmed. One view of the case may be closely pressed, as it is more easily seen, and strikes home in so many quarters; that is, the influence of the school atmosphere as a prolific source of consumption, proved by its influence on the health and life of teachers. I have known of thirteen teachers who have died, as the saying is, "in the harness;" five by accident, and every one of the others by consumption.

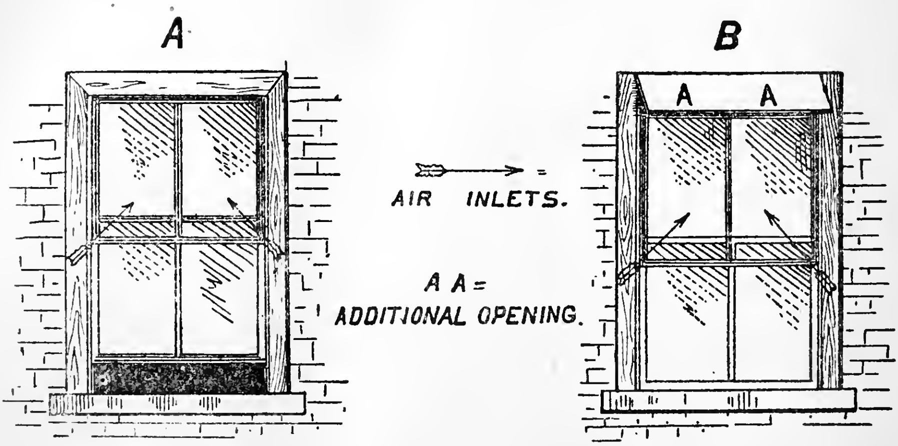
Dr. Workman has made a careful estimation from the tables of the Registrar-General and arrives at the conclusion that the average life of the teacher is 38 10-12 years, and further, from the same tables, shows that the proportion of deaths from consumption among teachers is greater than among sempstresses and, in fact, lower than in only one other occupation. If, then, life in the school-room is so prejudicial to the health of the adult teacher, what must it be to that of the tender undeveloped child? The cause is not far to seek. Dr. McCormack of Belfast, in his work on the relation of re-breathed air to pulmonary consumption, asserts that it (re-breathed air) is the sole and constant cause of this disease. Prof. Leeds says consumption is almost entirely the result of re-breathed air; and that it is as preventable by the exclusive use of pure air as *mania a potu*—drunkenness—is by the exclusive use of pure water.

The man who invents a practical foul air alarm will be a great benefactor to the human race. What a blessing it would be to have an instrument hanging in every church, and school-house, and public hall and sleeping-room, which would, as soon as the foulness reaches, say 10 or 12 parts of carbonic acid in 10,000—*i.e.*, two or three times the normal quantity—set up a ring-ding-ding-ding, like a fire alarm. The preacher and the teacher would be silenced and the snorer disturbed until pure air be supplied by some means.

Expedients for Ventilation.

Medical and scientific authorities agree that school-rooms should be provided with 1,000 cubic feet of air space per pupil, and also with the means of changing that amount three times per hour. I do not know of any school house so well provided. The average cubical capacity of the rural schools in this division is 267 cubic feet per pupil. Thirty-two per cent. have ventilators in the ceiling. The chief purpose served by these is to make the school cold in the winter. Nine per cent. are fitted with flues or ventilators in the walls or chimneys. I have tried to get trustees to have the upper window sashes adjusted so that they can be lowered and closed. Seventy-nine per cent. of the schools are now fitted with movable upper window sashes, but only about fifty-five per cent. with window sashes hung by weights over pulleys, and I find in practice that it is only the latter which are made really effective for the purposes of ventilation. It is not indispensable that the weights be hung in the inside of the frame. If it is too much trouble to put the weights there after the house is finished, let the pulleys be fixed to the top of the frame, and the weights move up and down in front of the sides of the sashes. Two schools have stoves enclosed in jackets which are supplied with currents of fresh air by ventiducts leading from the outside. Ventilation by the windows is the most common method. Unfortunately some teachers excercise but little judgment in using this means. Occasionally one finds a window opened on the windward side of the school house, and the breeze blowing strongly against the heads of the

children sitting near it. Teachers should ever hear Dr. Angus Smith's warning ringing in their ears: "Though foul air is a slow poison, a blast of cold air may slay like a sword." The death of a delicate child attending a school adjoining the city resulted from exposure to draft. A few weeks ago I was informed of the case of a boy who contracted congestion and inflammation of the lungs by sitting near a drafty window in our city high school. The case was so serious that for several days the doctor and friends despaired of his recovery. Windows should always be opened on the leeward side of the house, unless they are provided with appliances that will give the draft sharp upward flection. The latter object is accomplished by placing a strip the length of the window frame, the width of the opening, and the thickness of the frame under the lower sash (see Diagram A). The raising of the under sash accomplished in this way makes an entrance for the air between the sashes. It is less trouble to fix a strip of board under the top of the frame at a sharp angle with the top bar of the upper sash (see "AA" in Diagram B), and then lower the sash. If the window is on the windward side the sash may safely be lowered an inch or two, or if on the leeward side pulled down to make an opening of eight or twelve inches.



Ventilation, by heating air drawn by flues from the outside in a chamber constructed round the stove, is an excellent method, but the chamber should be fitted to the stove in such a way as to expose part of the metal so that wet or cold feet can be dried or warmed at it. A register may be placed in the floor under where the stove will stand. The register draft may be fed by two zinc or galvanized iron pipes leading air from the outside, or by a matched covering of the joists between which the register is placed. In either case the flues, whether zinc or wooden, should be so close as not to allow the air "from the cellar" to be drawn into the house. Such a chamber as this eeds a strong current of fresh warm air all the time that there is a fire in the stove.

Speaking of ventilating flues, it may be safe to state as a rule, they are practically useless in rural schools unless they are warmed by the smoke flue's passing through them, or are heated in some other way. It is really surprising to find how many people think cold air and pure air are identical. I have several times, on complaining of the ventilation of the room, heard the command given a pupil to "close the damper."

One seldom sees an evaporating pan on the stove, or any other means adopted to maintain the proper hygrometric condition of the air in the school-room. It is not generally known that external air at freezing point brought into a room heated to 65° or 70° requires at least four times as much moisture as it contained outside.

"I wish I had time," said Prof. Leeds, in a lecture before the Franklin Institute, "to explain the dreadful effects of this want of moisture in all our artificially heated rooms. The air in winter is very dry, the moisture is squeezed out as the water is squeezed out of this sponge. But as you heat it you enlarge its volume again, and it

sucks up the moisture just as this sponge does, and if you do not supply this moisture in other ways it will suck the natural moisture from your skin and from your lungs, creating that dry, parched, feverish condition, so noticeable in our furnace and other stove-heated rooms. Few persons realize the amount of water necessary to be evaporated to produce the natural condition of moisture, corresponding with the increased temperature given the air in many of our rooms in winter. Air taken in at ten degrees and heated up to seventy, the ordinary temperature of our rooms, requires about nine times the moisture contained in the original external atmosphere, and if heated to a hundred degrees, as most of our hot air furnaces heat the air, it would require about twenty-three times the amount in the external atmosphere."

In concluding my remarks on ventilation, I give the common and simple test for excess of carbonic acid. Fill an eight oz. vial with pure water (rain or distilled); empty out the water in the room, the air of which you desire to test. Emptying the bottle of water allows it to fill with the air of the room. Pour into the bottle ½ oz. clear lime water and shake thoroughly. If there is no perceptible milkiness or turbidity the air does not contain more than eight parts carbonic acid in 10,000. If a half oz. of lime water shows turbidity in a six oz. bottle, there is at least eleven parts in 10,000; if the same in a two oz. bottle shows turbidity, it indicates upwards of forty parts in 10,000.

Warming.

The usual method of warming rural schools is by a cast iron box-stove placed near the front door. In a few cases it is screened to protect the pupils whose seats are near the stove from direct radiation of the heat; but usually no such protection is provided; nevertheless pupils—salamanders they might be called—are found willing to sit all day in close proximity to the hot stove. Some teachers, pupils, and parents do not seem to have the least idea of the great danger of sitting for hours in a temperature of 100 degrees, and then running out into the cold, with little or no extra wrapping. If pupils have to sit near the stove trustees should see that it is screened by some means. The *Scientific American* has highly recommended an open ventilating stove called the "Fire on the Hearth;" and I have read strong recommendations by Prof. Johonnot, author of "School Architecture," and some Normal School Principals, of that or a similar ventilating stove for use in schools. It is evident that a heater, combining the advantages of a box-stove and an open fire-place, is a *desideratum* for the school-room. This is a point which I hope will be discussed at this meeting.

Not many rural schools are supplied with a thermometer. Where it is supplied it must usually be regarded as more ornamental than useful. I knew of one case, but only one, where the "stove monitor" took his stoking orders, not from the teacher, but from the silent monitions of a thermometer. His instructions were to keep the mercury between 63 and 70 degrees. Every school-room should have one or two thermometers, not for show but for daily use. Teachers should be particular that no child sit long in a part of the room that is either much too hot or too cold.

A few old-fashioned teachers still retain a practice that was once quite common—that of writing, classifying and numbering the "Rules of the School," and posting them up in the room. The practice is becoming obsolete, because the modern teacher is finding out that there is more law and rule written in the heart and conscience of a child than he can post on the back of the biggest door. But I once saw a catalogue of "Rules, Offences, and Punishments," that had in it a rule, not written in the conscience of the average school-boy, and which, I fear, does not often cross the mind of many a better teacher than the maker of the rule. It was this: *No scholar may sit in school with wet feet.* "How do you enforce this rule?" "When I think occasion requires it, I say, after assembling: 'All in the room with wet feet stand up.' Those who stand have either to put their stockings under the stove or go home to change them." If such a rule as this were generally observed, children would become less careless about getting their feet wet, and they would not have nearly so many colds and allied complaints. On days when mothers may know, from the condition of the weather, roads, or shoes, that their children can hardly avoid getting their feet wet they

ought to provide them with an extra pair of stockings to be exchanged for the wet ones on their arrival at the school-house. Few causes will more certainly produce sickness than sitting all day with wet feet resting on a cold floor.

Lighting.

A few years ago it was not uncommon to place windows in the end of the room in front of the children. But the increase of hygienic knowledge and the demand for more blackboard have almost removed this evil. In Germany, by law, light must be admitted either from the ceiling or from one side only, and the seats and desks must be placed so that when the pupils are reading or writing the light will be supplied from their left. The height of the window-sills from the floor should always be as great as possible. The nearer the approach to lighting from the roof the better. Robson, the best English authority on the subject, says the sills should never be less than five feet from the floor, and may be even more, with advantage both for lighting and ventilation. Dr. Linell, of Norwich, Conn., who has studied the subject very carefully, says that windows should always be on the *side* of the room, and there should be thirty square inches of window space to every square foot of floor space. He has recently examined the eyes of 700 school children varying from seven to eighteen years, and found that only 61 per cent. of them had normal vision. In that number there were 87 cases of myopia, the ratio of myopia increasing with the ages of the scholars. Much responsibility rests on the teacher in this matter. Diseases of vision from causes peculiar to the school-room most frequently arise from improper postures of the body, and wrong habits of holding the book. The teacher must be blamed if the children, during the writing exercises, crouch over the desk until their noses are within two or three inches of the slate or paper.

Water Supply.

In rural schools, even more than in urban, a plentiful supply of wholesome water is necessary, because the children at the former do not go home for their dinner, but at noon hour eat a dry luncheon, generally swallowed hurriedly, as they are in haste to proceed with their play. I say *generally*, because a few teachers require the children at the beginning of the noon recess to get their dinners from their baskets, return to their seats, spread a napkin or piece of paper, and, in an orderly manner, partake of their repast before they go out to play. Sitting in a dry, hot room produces thirst; this, many of the children increase by bolting a luncheon at intervals in the middle of exciting play, and that, during the warmest hour of the day in the summer; consequently they drink a comparatively large quantity of water. They are not often over fastidious as to the quality of the liquid with which they wash down their luncheons or quench their thirst. If the pump is not in working order, or the pail be empty, they eat snow or run to the nearest spring. I have heard of their dipping water out of the road-side ditch. A good well in a school-yard is invaluable. It ought to be carefully lined with stone or brick; the upper part of the lining should be laid in water-lime to make it impervious to soakage from the surface or the burrowing of rats, frogs, etc.; it should be supplied with a strong pump, having a "let-off" below the reach of the frost, that cannot be closed summer or winter. It should be covered with an absolutely close covering, laid on with sufficient slant to run the waste water off. Your thirst would be great if you could drink the water after seeing three or four children standing with dirty feet at the pump spout washing their sweaty hands and faces and all the washings audibly trickling down into the well. Under no circumstances should be omitted the duty of pumping the well empty, if possible, two or three times a year, or at least just after the spring thaw and again at the end of the summer vacation.

The plan of carrying water in a pail from a neighbor's is not to be commended. The supply is apt to be irregular and insufficient, not to speak of the annoyance and inconvenience often occasioned to the neighbor whose well is thus appropriated by the school section. The corner of the school-room where the pail stands is often in a disgusting condition. The leavings are thrown on the floor, dust sticks, filth collects, at last mud has the monopoly. Then the school-pail; it is enough to say it is usually

wooden and unacquainted with hot water. The pail plan should be tolerated only when it is impossible to get pure water on the school ground. The probability of getting good water should invariably be considered in the selection of a site.

In this division, last spring, I found that forty-five per cent. of the schools were supplied with wells and pumps in working order. Twenty-eight of these—more than half—were considered pure and wholesome, eight of them doubtful, and the rest were pronounced bad and unfit for drinking purposes. Thirty per cent. depended entirely upon the neighbors. In some of these cases the water is carried in a pail, whether the snow is deep or the roads hot and dusty, for a quarter of a mile or more. The remainder drew their supplies from springs, resorted to expedients that came most convenient, such as eating snow, or did without altogether. Nothing about the average school seems to receive more severe letting alone from those whose duty it is to keep them in order than the school well and privies. Not one well in twenty is properly lined and covered, consequently it soon needs cleaning; the cleaning is neglected; it goes from bad to worse; the well gets a bad name, and it not infrequently happens that it is allowed to cave in and gradually fill up.

Before the summer holidays I mailed a circular to every school section, from which the following is an extract: "When decaying earth worms, frogs, snakes, rats, sewage or rotten wood is in the well the water becomes unwholesome, and the well should be cleaned out. Perhaps the best test for such organic impurities, in inexpert hands, is to put one or two drops, or enough to give a pink colour, of a solution of permanganate of potash in an ounce vial of the suspected water. The solution should be of the strength of eight grains of permanganate to an ounce of pure water—distilled water, or filtered rain water caught in the open, or the London water-works water will do nearly as well, if more convenient than the others. If the water be unfit for drinking the colour will be discharged, or bleached, in about twelve hours, and usually the impurity may be seen precipitated at the bottom of the vial. The test is more satisfactory if a similar bottle of pure water be treated the same as the suspected sample and placed along side it for comparison." In some cases where this simple test was applied it resulted in the well's receiving a thorough cleaning. The average distance of the nearest privy from the school well in this district is thirty-nine yards. I have not heard many complaints of the pollution of the water from this cause. In one school section, No. twenty, London, where diphtheria violently broke out, the head of a family that lost five members told me that he attributed the disease to the proximity of the school well to the site of an old filled up privy vault. This brings me to the subject of

Sewerage.

The description of the out premises of country schools given by Prof. Church, of Greenville, at the Sanitary Convention held there last year, is so graphic and generally applicable that I cannot help repeating it here. He said :—" On many school premises one may see a mean, dilapidated building, bearing all possible marks of disrespect and execration, remote from the school-house, difficult of approach to sensitive pupils at all seasons of the year on account of its publicity. In the winter snow sifts in at numerous crevices; the northern blasts make it a veritable cave of the winds; in winter it is as comfortless as an iceberg; in summer as malodorous as Tophet." One of the particulars he enumerates is not so generally applicable as the others, that is the remoteness. I know several cases where more remoteness would be very desirable. Most people have a lively fear of drinking water contaminated by such sewage, but few fear disease from air thus polluted. An instance of death and disease from the latter cause occurred at Pittsfield, Mass. Partly because of its boasted salubrity a ladies' seminary was established there and well patronized. But through ignorance or carelessness foul gas from the vaults and cesspool at times pervaded the building, and as a consequence, fifty-one out of the seventy-seven young ladies in the institution were attacked with typhoid fever, of whom thirteen died. Thorough investigation, conducted by Doctors Palmer, Ford and Earle, proved that the polluted air was the cause of the epidemic. In most cases the rural school closet consists of a vault over which

is constructed a small frame building. These usually last for many years without being emptied or disinfected. I am sure they are a source of much harm and danger to the health of the children. The system ought to be radically changed. The old-fashioned vault is falling into disrepute with sanitarians everywhere. No class would hail a practicable reform of this evil more heartily than school-trustees. I believe they would readily adopt an inexpensive dry-earth closet if its working could be clearly explained, and its advantages shown.

The official regulations on school accommodation require that there be separate offices for the sexes, and that the entrances be screened from view. In this district there are three schools out of the hundred with only one closet; only about thirty-five or forty are properly screened from the general play-ground and school windows. Four have urinals attached to the boys' closet. These are useful in keeping the seats clean. Nine are reported to be regularly disinfected, the disinfectants being lime, chloride of lime, road-dust, or ashes.*

Furniture.

Reference will be made to seats and desks only. In this particular, I believe East Middlesex is the most favoured county in the province. The seat and desk best combining convenience, comfort, elegance and cheapness, that I have ever seen, is a pattern manufactured by Bennett Bros., London, East. It is adopted in about one-third of the schools of this district. The seats in nine of our schools are very ill-constructed, they slope downwards to the front; in twenty-one schools the seats are so high that many of the smaller children cannot, while sitting back on the seat, rest their feet on the floor; in ten schools the desks are so low, and the seats so high, that their occupants cannot maintain while writing or ciphering, a properly erect position. None except those of the pattern referred to (it is not patented) are constructed with proper curvature of the seat and back suited to preserve the natural shape of the body.

The importance of correct seating can hardly be overestimated. "To the badly constructed seats and desks," says Dr. J. C. V. Smith "we can trace in some measure the cause of so many distortions of the bones, spinal diseases, and chronic affections now so prevalent throughout the country." Another authority, Dr. Woodward, blames defective school seating as the cause of numerous instances of deformity of the spine, especially with delicate female children. In rural schools there are always pupils of widely varying sizes and ages, and consequently there should be three or four sizes of seats and desks in all such school-rooms. To aid in maintaining the upright posture of the occupant, the seat should be placed so close to the desk that the inside edge of the latter should slightly overlap the front of the former.

Cleanliness.

On a little reflection one would naturally conclude that few houses require to be more frequently and thoroughly swept, dusted, scrubbed, and whitewashed, than a school-house. But I am ashamed to confess that few inhabited houses are more neglected in some of these respects than the average school. One of my schools is swept twice a week, six three times, two four times, and the rest daily. In nearly half the schools, the trustees leave the sweeping to be done by the children and teacher. In such cases it is generally done at noon, and often children may be dimly seen eating their luncheons in a cloud of dust. Not more than a third of the teachers report provision for dusting, after the dust has had time to settle; hence in most cases, the proportion of it that is not inhaled by the children, or settles on the floor, is wiped up by the children's clothes when they use their seats and desks. One teacher reports that his school has been scrubbed only once in five years, another twice in five years, and a third that neither he nor the pupils know when it was last scrubbed, in fact that there is no record that it ever has been. The average number of times the school houses in this

* Disinfectants.—Chloride of lime,—sprinkle around dry; copperas (sulphate of iron),—dissolve in the proportion of one pound in a gallon of water, and wash or sprinkle with the solution; whitewashing with lime,—put some copperas solution in the whitewash. The chloride of lime is put up in close half-pound boxes at five cents each; copperas is about five cents a pound.

district have been scrubbed is four times in three years. I have no statistics on the whitewashing, but I do not think the schools are whitewashed on an average more than once in four years. Two of my schools have been finished in rough plaster which is marked off to represent stone. On their rough walls the dust and effluvia of the last ten years at least, have found an easy and undisturbed resting place. My reports and recommendations in favour of whitewashing are usually made in vain. It is not that trustees are afraid of having their school-houses too wholesome, bright, and cheerful, but that they have great difficulty in getting men to do the work for what they are willing to pay.

Some of our rural schools are clean, sweet, bright, and attractive, tastefully adorned with motto, picture and flower, but the number of such is too few. The description I have given portrays as correctly as I am able, the average surroundings from a sanitary point of view of the schools in this, the best county of the Province.

In view of these facts, you will agree with me that the Provincial Board of Health has ample opportunity to effect much good by disseminating a knowledge of sanitary science applicable to our public schools.

School Age.

In conclusion, I ask a discussion on the question of the best age for the commencement of systematic education. My more limited experience corroborates that of Superintendent Harris of St. Louis, who says that children entering school at the age of eight years, are generally further advanced at thirteen than those entering at five. I have read that while the gray matter of the brain is but partially developed, no exercise of the reflective faculties or mental efforts involving exercise in abstract ideas should be allowed,—that all formal labour of the mind required before the seventh year, being in opposition to the laws of nature will prove injurious to the mind. Further, that such ossification of the lower vertebræ of the spine as will permit much resting of the body in a sitting posture, without injury does not take place until the seventh year. If these statements be facts, the conclusion is inevitable that the minimum school age should be increased from five years as at present, to seven years at least. I am convinced by reasons other than the above, that a child of but five years is too young to commence school. If we increase the minimum age to six years, we shall be in company with fifteen of the United States in this matter, and still a year below the minimum age prescribed in France.

The belief is gaining that intellectual contraction, and even moral obliquity can be traced directly to bad digestion. Let us spread the belief. If parents were as anxious to rear their children good vigorous animals, as they seem to have them intellectual prodigies or prim, fashionable young misses, it would be vastly better for the race. Even the schoolmaster might rejoice, for his work of educating would be thereby rendered far more easy and successful. Were our boys and girls to live amidst favourable physical, mental, and moral surroundings, until they are fourteen or fifteen years of age, then—even were all props and guards torn away—they would in all likelihood continue to grow straight and strong. To accomplish this end, may you put forth every effort, and not weary until finally you or those who wear your mantle will be rewarded with complete success. Speed the time when dyspepsia and hypochondria will give way on every hand to vigorous digestion, the bounding pulse and their accompanying high spirits; when the *mens sana in corpore sano* will be the rule and not the exception; when instead of that formidable list of two hundred and forty-nine diseases classified in your first annual report, the number may in your last be reduced to euthanasia in old age, and perhaps *thanatici.*

Some Reasons Why so Many Persons Die of Consumption—From Facts Drawn from Mortality Returns and Sanitary Laws.

(By Dr. P. H. Bryce.)

Mr. Chairman, Ladies and Gentlemen,—It is not my intention to do more than state some of the principal points in the present much discussed question of the *zymotic* origin of Consumption, or more properly Tuberculosis, since I could do nothing more than give argument and counter argument. The question, so long one of doubt, has received within the past year or more a reviving interest, since the 10th of April, 1882, when Koch of Berlin gave to the world the results of long and carefully worked-out experiments, in which he seemed to have proved beyond doubt that certain *microbes*, bacilli, may be invariably found in the sputa of tuberculous patients. By the cultivation of these microbes in *blood*, under proper circumstances, and at a temperature as nearly as possible the same as those of the blood in the living animal, he was enabled to propagate them; and by injecting them into the skin in some cases, and in others into the *serous* fluids of the eye and the peritoneum he has been able to induce tubercular disease. He has thus fairly drawn the inference that the little *rod-shaped bacilli* from $\frac{1}{12000}$ to $\frac{1}{32000}$ of an inch in diameter are the direct and immediate cause of Tuberculosis.

Now while his experiments and conclusions are similar to those in the disease known as *milzbrand* in mice, where a specific bacillus may be cultivated which, if injected into or inhaled by these, causes their death; and while they are similar to those of Pasteur with reference to *chicken-cholera*, and of Hallier in regard to *charbon* in sheep, there is yet much doubt, inasmuch as strong biological, as well as pathological and clinical, arguments have been given against the theory.

Thus Prof. Sternberg, of the Johns Hopkins University, while admitting the probability of the correctness of Koch's views, asserts that inasmuch as having worked over very carefully Koch's experiments, and having found that the bacilli are not always present in *tuberculous sputa*; and moreover, since he has found similar *microbes* in the solutions used for preparing the specimens, it is not yet settled that Tuberculosis has its special bacillus, and is therefore a *zymotic* disease in the true sense of the term. Moreover he says that even assuming that, if the specimens are properly prepared, the bacilli may always be found in the *sputa*, it does not follow that they were the prime cause of the disease since they may very well have been subsequently inhaled.

But as if further to check the too hasty reception of the *zymotic* theory of Consumption, Dr. H. F. Formad, lecturer on experimental pathology in the University of Pennsylvania, in a recent paper not only doubts but directly denies that Koch has settled the question in favour of the zymotic origin of Tuberculosis.

He places his objections under ten heads:—

1st. He says the predisposition to Tuberculosis in men and animals, or the scrofulous habit, lies in the peculiarity of the anatomy of the connective tissue—this being a narrowness in the lymph spaces and their being partially filled up with cellular elements.

2nd. Only such beings can have primary Tuberculosis, and such animals do invariably become tuberculous from injury or successive injuries resulting in *inflammation.*

3rd. Scrofulous beings if affected will always have a scrofulous inflammation.

4th. Non-scrofulous men or animals may acquire the tuberculous tendency by malnutrition and confinement—the latter especially producing these changes in the connective tissue.

5th. No external etiological influences are necessary to cause tubercular disease other than those producing an *inflammation.*

6th. Non-scrofulous animals may become tuberculous by injury to serous membranes as the peritoneum, pleura, etc.

7th. Bacilli are not necessary to the causation of the disease. They are secondary and appear *to condition* the complete destruction of the tuberculous tissue.

8th. From microscopic observations and from post-mortem and clinical examinations

we have concluded that tuberculosis is not infectious; but that the individuals having it are specifically prepared to have it pending the onset of some inflammation.

9th. Scrofulosis, depending on malnurition and seclusion, may be induced or produced artificially.

10th. An analysis of Koch's experiments shows that its *bacilli* are not specifically differentiated from others; or, as stated by Dr. T. H. Salisbury (in Gaillard's Medical Monthly), the *bacilli* are but the baby forms of the mycoderma aceti, and that this ferment is the one readily inducing tuberculosis.

I have given you some of the *pros* and *cons* microscopically. Now, one word needs to be mentioned concerning some clinical facts. As far back as 1668 Riverius claimed that tuberculosis is infectious. Galen, Cullen, Andral, Budd, Beale and Da Costa, have all claimed that Consumption is an infectious disease, and out of 250 answers given by prominent American practitioners to questions issued by Dr. H. Bowditch, of Boston, 126 said Yes; 74 said Nay; 50 said Doubtful.

But further, many such cases as the following may be cited. As stated by Dr. Bela Cogshall, Flint, Michigan, a family came under his care of which the father and mother were originally healthy without any family taint, while nine children were born. 1st, a son died, 14 years of age; 2nd, the father died, 49 years of age; 3rd, a daughter died, 22 years of age; 4th, a daughter died, 14 years of age. Two moved to Dakota and remained in good health, while the Doctor stated as his belief that the rest would soon die unless they left the house, or had it thoroughly disinfected.

But further, Dr. Tappeiner, in the Tyrol, read in 1878 before the German Society of Naturalists and Physicians, a paper in which he asserted his belief that it is inoculable from the sputa. He made some experiments at the Zoological Institution, Munich, of which the following are important. He took tuberculous sputum, made an emulsion of it, and threw it upon the floor of a pen where three dogs were kept, and where as it dried out they inhaled it. To two other dogs it was given to swallow. The dogs seemed to remain for a time healthy. Some carmine was sprinkled over the sputum inhaled. The dogs were killed six weeks after the experiment began, when they showed miliary tubercles in the *lungs*, *kidneys* and *liver*, and those that swallowed it showed them in the digestive tract as well.

Again some precise facts are given from Neurenberg a town in Germany of about 30,000 inhabitants. A physician there had in his employ two midwives, called S. and R. S. was tuberculous. He noticed at a certain confinement that the nurse S. endeavoured to induce breathing in the child by breathing into its mouth and sucking mucus from it. Within three months this child died from tubercular meningitis. Within a few months *two* more children died from the same disease and had the same nurse. He found that between April 4th, 1875, and May 10th, 1876 *seven* other children besides these three had died, all being nursed by S.; while of all the children attended by the nurse R. none died of the disease. Here the infectiousness of the disease seems proved beyond doubt.

Cohneim and Solomonsen injected tuberculous matter into the aqueous humour and produced tubercles—first locally and then in the general system.

These facts and experiments go far in substantiating Koch's statements as to the inoculability of tuberculosis; and if the following statement of experiments made by M. Martin are substantiated by further researches, the objections to the zymotic theory must largely be overthrown. In a communication to the Société de Biologie, he claims to have proved that histologically *pseudo* and *true* tuberculosis masses are the same; but while the *pseudo* caused by the inoculation of foreign bodies creates tubercles locally, *true* tuberculous infection has the property of setting up a general infection. His experiments, he says, have proved that the virus of tuberculosis becomes more and more active in consecutive inoculations, while non-tuberculous matter becomes less so.

Finally, Dr. Budd remarks tuberculosis is, (1) a truly zymotic and specific disease, (2) it never results spontaneously, (3) the tuberculous deposits correspond exactly to the eruptions of scarlatina, etc.

Against this great array of experiments and clinical observations we have the following remarks by Dr. C. Theodore Williams, Physician to the Hospital for Consumptives, Brompton. He says:

1. The evidence of large institutions for the treatment of Consumption, such as the Brompton Hospital, directly negatives any idea of Consumption being a distinctly infective disease, like a zymotic fever.

2. Phthisis is not, in the ordinary sense of the word, an infectious disease; the opportunities for contagion being most numerous, while the examples of its action are exceedingly rare.

3. In rare instances of contagion through inhalation, the conditions appear to have been, (1) close intimacy with the patient, such as sleeping in the same room, (2) activity of the tubercular process, either in the way of tuberculosis or evacuation, (3) neglect of proper ventilation of the room.

4. In addition to the above, a husband may, though he rarely does so, infect his wife by coition; and this risk is considerably increased in the event of pregnancy.

5. By the adoption of proper hygienic measures, such as good ventilation, and separation of consumptive from healthy people at night, all danger of infection can easily be obviated.

I have endeavoured, ladies and gentlemen, to give some of the principal points at present bearing on the highly important question of the zymotic character or infectiousness of tuberculosis. But whatever the ultimate result of the many investigations now going on concerning the subject may be, there are certain other facts bearing upon the question of its prevalence, which it becomes incumbent upon all to learn and to comprehend the lessons they teach.

In a study of the Mortality Tables in the Registrar-General's Report, I had, as I suppose others have, remarked some statements in some ways so different from what one would expect, that I have endeavoured to determine for myself their accuracy, and, if true, to determine, if possible, the reasons therefor.

Those who may have looked into these returns will have found that Phthisis has the largest percentage of deaths set down against it. This amounts in the Report for 1881 to 10.8 per cent. of the deaths returned. It will be further found that the proportion of deaths from Consumption in the county towns (334,636 pop.), as separated from the rest of the Province, is almost the same, the first $10\frac{7}{10}$ per cent. of the total deaths, while the latter is $10\frac{4}{10}$ per cent.

Now, this struck me as contrary to the usual opinion—viz.: that Consumption is less prevalent in the country parts than in the cities and towns; since were it true the common idea that, as compared with rural life, the confined modes of life of many persons of the city populations and the crowding and poverty in other cases are potent factors in the causation of Consumption, must be modified or wholly changed.

Through the kindness of Mr. Crewe, of the Department, I have had prepared by Mr. F. Warwick some tables which explain the difficulty.

In order to get at the exact facts of the case, three points have to be considered.

1. The percentage of deaths from Consumption to the total deaths.
2. The percentage of deaths from Consumption to the total population.
3. The percentage of deaths from Consumption to the population, after deducting the deaths of children under one year of age. This has been done with the following results:

Population of the ten cities	230,645
" " towns	103,991
" " rest of the Province	1,578,824

		Ratio to Population.
Deaths in the ten cities	4,662	20·2
" " towns	1,636	15·7
" " rest of Province	16,523	10·4

		Per cent. of all Deaths.
Deaths under one year in the ten cities	1,485	31·8
" " " " towns	388	23·7
" " " " rest of the Province	3,373	20·4

			Ratio to Population.
Deaths, deducting under one year, in the	ten cities....	3,173	13·7
" " " "	towns	1,248	12·0
" " " "	rest of Prov.	13,150	8·3

Deaths under one year compared with births in	cities............	25·0
" " " "	towns	16·1
" " " "	rest of Province ..	10·4

Ratio of deaths to births in	ten cities.....................	100 : 127
" " "	towns	100 : 139
" " "	rest of Province	100 : 196

		No.	P. c. of deaths above 1 year.	Ratio to Pop.
Consumption, over one year in	ten cities	464	14·6	20·4
" " "	towns........	213	17·0	20·1
" " "	rest of Province	1,720	13·0	10·8

Total births in Province.................................. 40,714

		Ratio to Population.
Births in ten cities	5,901	25·5
" towns	2,422	23·2
" rest of Province	32,391	20·5

N.B.—Ratio to population everywhere means the number in every 1,000 of population.

To any who may have studied the tables by the method of comparison which has usually been adopted—namely, by taking the number of cases of deaths of any one disease, and comparing it with the total number of deaths from all diseases, the result of making the comparisons, as we have here done, must be most surprising. After making allowance for the greater imperfection of registrations in the country districts than in the towns and cities, which can be more correctly done by a comparison of the cases of deaths reported with those of the number of births, we find what we naturally expect, viz.: that while in cities there are 100 deaths to every 127 births reported, there are in the country 100 deaths to every 196 births reported.

Or again, we can obtain an accurate idea of the relative healthfulness of city and country from the fact that we find, by comparing the deaths under one year with the births, that while the cities have exactly 25 per cent. of deaths of all children born, the country has only $10\frac{4}{10}$ per cent.

Another point to be referred to on returning to the question of Tuberculosis is the fact that while in the cities the average death rate is 20·2, in the country it is only 10·4 per 1,000 of the population.

Now, in making the comparison of the relative prevalence of Tuberculosis, I have endeavoured to deduct every factor which would be likely to deceive. Hence, I have made the calculation to be based on the number of deaths after the mortality for the first year of life has been separated, for the reason that has already appeared to all, viz., that, as the mortality amongst children in cities is so disproportionately large, it would make, if retained, the number of consumptives in cities to appear less, since, were we to judge of its prevalence by its percentage of all diseases, we would, in the case of the city, have made the quotient small by having so disproportionately increased our divisor. Neither would it be fair to calculate it according to population with the first year's mortality included, since Tuberculosis not being returned as such in children under one year, we are introducing, in the death of children under one year, a point having no bearing on the question.

With these preliminary remarks we may now examine the returns for Consumption, and what do we find? We find the following:—

		Per cent. of Deaths.	Ratio to Population.
In cities, deaths from consumption	464	14·67	2·04 per 1,000.
In towns, " " " "	213	17·00	2·01 " "
In country, " " " "	...1720	13·00	1·08 " "

Or, in other words, we see that while the percentage of Consumption to all other diseases in the cities is 14·6, and in the towns 17 per cent., it is, in the rest of the Province, only 13·0. But again, if we make the comparison by examining the ratio of consumption to the total population we find that while in the cities it is 2·04 per 1,000, and in the towns 2·01 per 1,000, in the rest of the Province it is only 1·08. In other words there are some 1,500 lives annually spared to the Province which would have been lost had the rate existing in the cities been kept upon the country.

In order to make the study, if possible, still more certain and accurate I had prepared a statement of the ten chief causes of death in what I have called District IV. in the Weekly Health Bulletin; since, while we have in it a very large population and nearly half of this exists as town population, it may be taken as giving the most accurate returns, inasmuch as it is an old settled district with municipal government thoroughly organized.

Here, again, we find much the same ratio existing.

Thus, while in the thirteen towns having a total of 181,703 of a population the deaths from consumption, after deducting deaths under one year were equal to 15 per cent. of the total deaths, and two per 1,000 of the population; in the country, with a population of 388,363, we have consumption forming 14 per cent. of all diseases and only 1·1 per 1,000 of the population.

A coincident fact is seen in the figures for *brain disease* (largely a tuberculous disease) which give ·5 per 1,000 in the towns, and ·2 in the country. Other interesting facts might be adduced but enough have been given to show that Tuberculosis is very much more prevalent in the cities and towns than in the country.

Having settled this point of the comparative prevalence of Tuberculosis, let us discuss some of its bearings upon the question of causation :

In the year 1871, Dr. Henry Bowditch, Chairman of the State Board of Massachusetts, began an inquiry concerning the means of preventing Consumption. He issued a series of twenty questions to 210 prominent physicians in New England and elsewhere.

The following are some of these questions :

1st. Is Consumption caused or promoted by hereditary influences ?

205 answered Yes.
1 " No.

2nd. Can Consumption be prevented from occurring in children hereditarily predisposed ?

120 answered Yes.
20 " No.
15 said it can be retarded.

3rd. Is Consumption caused or promoted by the drunkenness of parents ?

51.43% answered Yes.
48.09% " No.

4th. Is Consumption caused by over-study ?

146 answered Yes.
21 " No.

5th. Is Consumption promoted by over-work in trades ?

162 answered Yes.
8 " No.

6th. Is Consumption ever caused by mental trouble ?

150 answered Yes.
18 " No.

7th. Is Consumption ever caused or promoted by contagion?
100 answered Yes.
45 " No.

8th. Is Consumption ever caused by exposed location or residence?
129 answered Yes.
38 " No.

9th. Is it caused or promoted by a damp location?
169 answered Yes.
21 " No.

10th. Is Consumption caused or promoted by immoral excesses?
147 answered Yes.
16 " No.

These questions, as will be at once seen, cover a very large field of inquiry, and the answers convey a large amount of exact information of great value. They are proofs in a large degree of opinions which have long been held.

We may roughly divide the various influences in the causation of Tuberculosis into three classes:

1st. Hereditary influences and those of Contagion.

2nd. Influences which reduce the vitality of the physical, and especially of the nervous system.

3rd. The influence of cold and dampness, producing internal congestions, colds, etc.

A few words may be said on each of these points.

Hereditary influences and those of Contagion.

This question of heredity is of so extended a nature that to attempt to compass it would be an impossibility. Suffice it to say that the opinion of Consumption being transmissible from parent to offspring is almost universal. Medically, it is called a tubercular diathesis. As Jaccoud remarks, "Whatever may be the outward appearance of individuals predisposed, the diathesis shows itself in the characters of its products, in a constitutional debility. The system is affected by irritative causes, powerless in themselves, but which, through the influence of the tendency induces not a rapid and transitory inflammation, but a formation slow, and of an evil character. What this constitutional debility consists of as a special thing, is difficult to define, but for want of anything more definite it is an '*insuffisance de la nutrition.*'"

This same condition, he remarks, is the chief characteristic of Scrofulosis, which, however, he believes to be a distinct diathesis from the tubercular, though in many characteristics and by many writers they are looked upon as one. Constitutional debility, he remarks, is the common course of the two maladies, and, as Scrofulosis is peculiar to infancy, so Tuberculosis is more peculiar to youth and adult age.

Both, he remarks, may be *inherited*, *innate*, or *acquired*, and the same causes are given as tending to produce both. The fact that Tuberculosis does, and may frequently occur in scrofulous persons does not necessarily prove that they are the same disease. He defines Scrofulosis as having a constitutional *dystrophia* with polymorphous products, having manifestations for the most part of an inflammatory character, occupying the lymphatic ganglia, skin, mucous membranes, the cellular tissues, and the fibro-osseous tissues and the viscera. In scrofula it is found that not only is the blood poor in red blood-corpuscules, but that it is generally abnormally fibrinous, and, moreover, the tendency to this condition is constantly present unless the most active measures are taken against it.

The contagiousness of the disease has been already so remarked upon, that more need not here be said.

Influences which reduce the vitality of the physical, and especially of the nervous system.

Of course, it is not necessary to remark that such influences exert themselves on

those of scrofulous and tuberculous habit as well as on other individuals. Not only is this true, but also, unfortunately, these are the ones, in many cases, most subject to such influences, both from personal habits and conditions of life. Amongst the questions propounded by Dr. Bowditch are the influences of (1) overstudy, (2) overwork, (3) working at unhealthy trades and occupations, (4) mental trouble, (5) immoral excesses. But while some of these are influences which, however important, it must be largely difficult to remove, a number of others of equal, if not greater, importance must be added. Thus, among the causes which Jaccoud gives for acquired Tuberculosis and Scrofulosis are (6) insufficient milk for the infant, (7) milk of bad quality, (8) artificial feeding with milk, (9) too early weaning, (10) lack of air and exercise, (11) unwholesome food, (12) precociousness and forced intellectual application, (13) excessive labours in the large manufactories of towns and cities, (14) living in dark and badly-ventilated places, (15) excessive use of alcoholics.

To this summing up of the terrible causes operating towards the same end are added the points coming under the heading of *Cold and dampness as productive of Tuberculosis.* Now, it needs but a glance at these influences, tending to reduce the vitality of the system, in order to see that with two or three exceptions they are almost peculiar to the dwellers in our towns and cities.

But in order to show the influence of some of these in the production of Tuberculosis, allow me to refer again to a few statistics :—

		Ratio.
In England, in 1872, there were (births)	825,907	= 6
Of deaths of children under one year	123,596	= 1

Again, forty-one per cent. of the annual death-rate is of children under five years. Further, this infant death-rate in some of the manufacturing towns, *e.g.*, Leicester, where it amounts to four out of every ten born, is frightfully large. In Paris, fifty per cent. die within four years of birth; whilst among the poor, seventy-five per cent. die within the first year of birth.

Having detailed these foreign statistics, I must again revert to the astounding and alarming fact that the infant mortality in the ten cities of Ontario amounted last year to exactly twenty-five per cent. of the births, while that recorded for the Province exceeds the rate for all England.

Now, it must be apparent to all, that if these statistics are true, or even approximately true, the influence of the same causes which produce these in promoting Tuberculosis must be evident; for one cannot suppose that the same causes do not produce the same effects after the first year which they have produced within that period.

Now, let us see if we can get at some of these influences.

From English statistics I find that the mortality of—

52,883 town hospital foundlings	under five years	....	= 72·2	per cent.
122,110 country "	" "	....	= 11·5	"

Again, seventy-four per cent. of the mortality in London in 1875 for July, August, and September was of children under one year from *Diarrhœa.*

Now, we have sufficient facts from statistics to show where the causes of death lie. Let us take the case of the foundling hospitals. It is only fair to assume that the management of those in towns is as good as of those in the country, yet there is a difference of sixty per cent. in the percentage of deaths in favour of the country hospitals. Neither can we assume that, constitutionally, the children in the one were better than in the other. Hence we conclude—

1st. That the food supplied in the country must have been better.

2nd. That the free air of the country must have been better, and that the children had more room for exercise.

In the latter factor we must assume that even if ventilation of the hospitals were no better at night, the influence of good air during the day must have provided against injurious influences of the close air of night. But without going further with this argument, we must return to the original question.

Among the factors causative of Tuberculosis, we have seen that many of the same ones are at work, in after years which were at work amongst children under one year.

These summed up as being more prevalent in towns, are :

1. A greater proportion of originally bad constitutions.
2. More than twice the tendency to acquired Scrofulosis, as seen from the greater number of deaths.
3. Bad food.
4. Bad ventilation, and too little fresh air.
5. Early work and over-work amongst the poor.
6. Nature of the occupation.
7. More immorality.
8. Too little sun-light.
9. Bad water.

I have time to refer to only a few of these.

Bad Food.—With reference to bad food, the dangers are best illustrated from its effects upon the delicate digestive system of children.

Thus in the report of the Children's Hospital, Manchester, 79 per cent. of the deaths are stated to have been wholly or partly due to defective or faulty nutrition. Again, from the Foundling Hospital Report of London, a mortality is given of 36·1 per cent. for children nursed by work-house mothers, to 6·1 of those nursed by their own mothers. Are further facts necessary ?

Bad Ventilation.—Again it is stated that up to 1872, when a good system of ventiation was introduced into the Lying-in-Hospital, Dublin, the rate of infant mortality was 1 in every 6 births within the first fortnight of existence ; but that after this the death-rate decreased to 1 in every 19½ births.

Further it is stated by Captain Douglas Galtin, in a recent address before the Sanitary Institute of Great Britain: that the deaths amongst the teachers in the elementary schools of London is 20 per 1,000, while that amongst convicts in well-regulated prisons is not more than 3 or 4 per 1,000. Finally he remarks, that if one were to choose between good air and little food, and bad air and good food, he would choose for the child the former.

In connection with the subject of the dangers resulting from impure air in causing Consumption, many important facts might be given : but one bearing upon the question of its being caused by microbes, is of importance.

M. le Dr. Miquel in the results of seven years' experiments at the Montsouris Observatory, Paris, states that while in the free air about the observatory a man would daily inhale in winter :

Montsouris { 300,000 spores of cryptogams.
2,500 bacteria.

he would inhale in Hôtel Dieu { 80,000 spores of cryptogams.
141,000 bacteria.

Supposing this be true, and there is no reason to doubt it, what a powerful argument is here advanced for ventilation, since not only would the *bacteria* of hospitals and dwellings be dispersed, but the impure air and organic vapours and effluvia from the body which supplies nourishment for them must likewise be indefinitely lessened.

Again, would not the dangers to nurses and the families of consumptives from contagion—if such ever take place—be greatly lessened, as remarked by Dr. Williams, by thorough ventilation ?

Impure water can only be spoken of incidentally here with impure milk ; but both no doubt are factors in weakening the power of the system to resist the onset of the disease, as, for instance, has been shown during the past year by the persistency amongst the inmates of one public institution, of diarrhœa, and in another of a low form of fever and the prevalence of sore throat.

Concerning the third point, *that of dampness and cold*, most indubitable proofs of its potent cause in promoting Consumption are given.

Thus it is stated in Dr. Jones' Returns that the drainage of the fens of Ely and

of those of the Isle of Wight has greatly improved the healthfulness and reduced greatly the mortality from Consumption and kindred diseases. Thus, in one noted district the annual mortality

In 1871-74 was only = 1·7 per 1000.
In 1851-60 deaths from phthisis = 2·8 in 1000.
In 1861-70 " " = 1·9 "

Need anything more be stated on this subject with these facts before us? If so, let us take but one example from tables prepared for me by Mr. Warwick. In District VI. (12·3), of the Health Map, with a total death-rate almost equal to that of District VII. (12·1), I find the deaths from Consumption to be the following:

	Percentage of total deaths.	Rate per 1000.
District VI	8·5	1·02
District VII	12·7	1·64

The characteristics of the soil in these two districts must be well known. A large proportion of District VII. is flat and composed of the Erie clays overlaid with vegetable deposits, as marsh, and having much malaria; while District VI. is largely a gravelly soil with good drainage, a district in which malaria is practically unknown.

To return to the question of Consumption in its relation to wet soils: the extended investigations carried on in the English counties of Surrey, Kent and Sussex, by Dr. Buchanan, set forth their influence in bold relief. Taking into account very many difficulties affecting the calculations, he has established the following: "That the districts with less phthisis are seen to have more of their population on sands, and less on clays, and those with more phthisis to have more population on clays, and less on sands, the descending series of the percentage numbers on sands, and the ascending series of those on clays being wonderfully nearly regular for the districts arranged in the order of their Consumption. So much is this the case, indeed, that they could not be expected to be more regular unless one should go the length of contending that phthisis was a disease influenced by no other circumstance than the one condition of soil." Giving further his his conclusions we see that:

1. Within the counties of Surrey, Kent and Sussex there is, broadly speaking, less phthisis among populations living on pervious soils than those on impervious.

2. That there is less phthisis amongst populations living on high-lying pervious soils than those on low-lying pervious soils.

3. There is less phthisis amongst populations living on sloping impervious soils than those on flat impervious soils.

We have further conclusive proof on this point:

4. Thus, data show that sewerage and drainage in towns have largely decreased phthisis, and that it had not been reduced in other towns where the soil had not been dried.

Thus in Salisbury it had been reduced 49 per cent.
" Ely " " 47 "
" Rugby " " 43 "
" Leicester " " 32 "

and so on.

In conclusion, then, we point not only to the many above enumerated causes of phthisis and the various means which are best calculated to lessen its ravages, but also wish to draw attention to even the broader fact that those conditions so favourable to its development are those most calculated to propagate the whole class of *zymotic* diseases whose germs seem to develop best under these conditions of soil and moisture. As we see, with reference to malaria, statistics have shown the two diseases to run side by side in prevalence in this Province in at least one district, while the same thing has been illustrated in England by the almost entire disappearance of malaria in these drained wet districts. The facts that kidney diseases and pneumonia are increased, that neuralgias and rheumatism prevail in wet districts, all point to the one great panacea, in city, town and country where such wet soils prevail, viz., drainage.

ARTICLE III.

PAPERS READ BY MEMBERS OF THE BOARD BEFORE THE HAMILTON LITERARY ASSOCIATION.

"STATE MEDICINE, ANCIENT, MEDIÆVAL AND MODERN."

(By Dr. Covernton.)

Mr. President and Gentlemen,—On receiving intimation from Dr. Oldright that it was the desire of the members of your Institute that a short course of lectures should be given, during the winter and spring session, on the subject of Hygiene, by the members of the Ontario Board of Health, it occurred to me that it would be difficult for us to bring before you anything particularly new, as I was well aware that the great importance of prevention of disease was fully recognized, and the measures for accomplishing it, as thoroughly understood by our *confrêres* in the medical profession, as also by the sanitary engineers in your city, as by any professional men outside of it. As, however, this particular branch of medicine, having for its object the prevention of the waste of human life, the guarding against and the perversion and alienation of the mind, the diminution of disease and suffering—so far as the fate of man is in his own hands—is successful or otherwise, according to the way in which its precepts have been observed, or despised, particularly in the prevention of the spread of epidemic disease, and that successfully to protect individuals and communities from such, the means enjoined *must* be implicitly observed, and the health laws as understood by sanitarians rigidly enforced, hence, therefore, the primary necessity for local boards of health and medical health officers for every municipality in the Province. The functions of these boards, the general supervision of dwellings and surroundings, the careful registration of deaths, births and marriages, the enforcement of measures for securing pure water, pure milk, pure food, the securing of good drainage and sewerage in streets and in public and private buildings, the free ventilation in schools, colleges, hospitals, the prompt and effectual isolation of cases of infectious disease, the securing universal vaccination within the jurisdiction of the locality and, though last, not least, proper attention to the trapping of all water-pipes leading to sewers, so that no danger may have been incurred, of the ventilation of house drains and sewers into the bedrooms, instead of into the open air. Now, compulsory removal of nuisances, public and private, compulsory vaccination, compulsory removal to isolation hospitals, where perfect isolation cannot be accomplished at home, compulsory hygienic architecture, etc., etc., seriously interfere with the *I* and mine, and the general *common* weal is too frequently made subordinate to the individual will, and thus early stamping out of infectious disease frustrated. Other impediments to the work of the sanitarian, in the form of vested interests, general objection to sumptuary laws by members of the Anglo-Saxon race also exist, and the liberty running into license, developing selfishness is more apt to be exercised than liberty regulated by law tending to general beneficence. Liberty to spread, broadcast, disease on the community by the neglect of due sanitary precautions should not be recognized in civilized society. The law does not permit the turning loose of a glandered horse or a mad dog for fear of injury to the inhabitants, but more deadly enemies to the population, in the shape of diphtheria, small-pox, scarlet fever, frequently are rife in dense populations, simply because the prompt and complete isolation of the initial cases has not been attended to. Legislatures of different countries have ever been prompt in protecting by enactment the cattle of our fields from foreign contagion, and our Ontario Legislature have wisely recognized the importance of protecting the people from contagious diseases by placing in their Statutes, enactments, which if universally and quickly attended to, would suffice for the stamping out of these great factors of a large death-rate. The difficulty, however, with the medical attendant in insuring success in his attempt to limit the spread is the too frequent disregard of the public for hygienic teaching, and even a disposition manifested for regarding the practitioner who endeav-

ours to inculcate it as a meddlesome *quidnunc* and theorist. Our visit, then, to your city is merely for the indorsation of the wise counsels of your own physicians.

That hygeinic law enforced by, and at the expense of, governments, for the prevention of disease and for limiting morbid influences, by conditions over which the people have no control, has from the most remote periods been in vogue, we have abundant testimony, and should I succeeed in this brief sketch of the science as known and practised in ancient, mediæval and modern times, in proving to you that these grand objects have been fulfilled or otherwise, according to the way in which its precepts have been observed or despised, you will, I doubt not, hold me excused for selecting a subject not absolutely within the scope of the Institute. Scientific hygiene has for its objects not merely the preservation of health; it aims also at ameliorating and perfecting the various instruments of life, at promoting the full development of all the powers of the system, of moderating or exciting the vital powers, augmenting or diminishing their energy, and modifying in a variety of ways the form, the size and the activity of the several parts of living bodies. Many people suppose that hygiene or State medicine is of modern institution and practice; this is certainly a great error, as it dates back to the very earliest recorded period. In the 13th Chapter of Leviticus you will read of a medical officer of health, endowed with fuller and more stringent powers than the State at the present day accords to any such officials. Strict rules are laid down for the separation of the sick from the healthy, which it would be well for all communities to adopt at the present day as regards Zymotic diseases, which we can never hope to stamp out except by complete isolation, which, under the Mosaic rule, was most effectually done. It is quite evident that under the term leprosy, all skin diseases were included. The rules are extremely minute between infectious and non-infectious diseases. Verses 2 and 3 indicate an unmistakably infectious disease; verses 4 and 5 refer to doubtful cases, and in the 6th, rules are laid down by which the priest shall judge if it be non-infectious, and orders given for the liberation of the patient; the 7th and 8th verses indicate that even after liberation the patient was stiil under the inspection of the medical officer of health, and that if there be any spreading, he can be at once pronounced unclean. In the 33rd verse, in giving directions regarding the appearance of the hair, the scalp is directed not to be shaven lest the place should be irritated and inflamed, and assume in consequence other appearances than those of leprous affections, in which case the priest might not be able to form accurate judgment. In verse 47 the whole account seems to intimate that the garments were fretted by the contagion, therefore, in verse 52, it is ordered that the garments shall be burnt. The Officer of Health, after using milder means without success, employs the most powerful disinfectant we possess, viz.: fire. Chapter XV. refers evidently to diseases unfortunately existing in our own time, and for the control of which minute directions are given.

In ancient Egypt, a high degree of refinement and luxury had been attained at a time when the whole western world was still involved in barbarism, when the history of Europe, including Greece, had not begun, and long before Carthage, Athens and Rome were thought of. This high state of material civilization was attained under a system of institutions and policy resembling those of the Hindus: a monarchy, based upon an all-powerful hierarchy. The priests filled the offices of the State. *They* were the expounders of the law, as well as of religion, and were the physicians, judges and architects. The Grecian philosophers were assisted by the Egyptian sages, who appear to have obtained much of their knowlege from some mysterious nation of the East—*India*, most probably. Among the sacred records of the Hindus there is a system of medicine prepared at a very early age. Professor Wilson has given an interesting account of Hindu medicine, and a most comprehensive work on their system of medicine was published by Dr. Wise, of the Bengal Medical Service, in 1845. Dr. Wise remarks that, although the native practice of medicine may now be said to be in a lamentable state of depression over all Hindustan, it was far otherwise as cultivated by the *ancient* Hindoos. A very few practitioners may still be found in the neighbourhood of cities, in the service of rich individuals, in whose families the ancient treatises of their forefathers are studied, and transmitted from generation to generation. The climate, and the materials of which these ancient works are composed render them very liable to be destroyed. Some are

already lost and the difficulty of procuring correct copies of the remainder is yearly increasing. Dr. Wise, in a commentary of 430 pages, has given an extended view of their system of medicine. Of the wisdom of the East, we are informed in the Bible, 1st Kings, chapter 4: "And Solomon's wisdom excelled the wisdom of the East, and all the wisdom of Egypt." A people who had distinguished themselves at such an early age, by their power and riches, as well as by their successful cultivation of the sciences, may be supposed to have studied, with much care, the means of succouring the wounded, of alleviating pain, of preventing and curing diseases. The Hindu history of medicine proves this to have been the case, for one of the fourteen precious objects which their gods are believed to have produced by churning the ocean, was a learned physician. This proves of what importance they considered the healing art, and accords with the opinion of the best informed of the ancients. In the edition of Indian history, by Mr. Brooks, Arrian informs us, that in the expedition of Alexander to India, the Grecian physicians found no remedy against the bites of snakes, but the East Indians cured those who happened to fall under that misfortune—further, that when any were indisposed, they applied to the Brahmans, who by wonderful, and even more than human, means, cure whatever will admit of it. The sacred medical record of the Hindoos is said to have consisted of one thousand sections. Bramha, pitying the weakness and suffering of mankind, and the impossibility of their learning so large a work, abridged it and divided it into eight parts: The first and second divisions constitute the surgery of modern schools; the third may be considered as constituting the practice of physic; the fourth, on the means of restoring the deranged faculties of mind, supposed to be produced by demoniacal possessions; the fifth comprised the treatment of infants; the sixth administration of antidotes to poisons; the seventh prevention and cure of disease. Medicines which restore youth, beauty, and happiness, strengthen memory, and lengthen life—in other words, State medicine and hygiene. Unfortunately the fabled spring of perpetual youth, so eagerly sought by Ponce de Leon and other dreamers, still hides its source in Lotus Land and will hide there forever. The second section in therapeutics is devoted to this subject. The Hindoo legislators appear to have been convinced, at a very early period, of the importance of a knowledge of the means of preserving health and preventing disease, as we find various laws enacted for this purpose, and in order to enforce those precepts among a rude people, incapable of appreciating their importance, and disinclined to obey them, *religion* was employed to afford its powerful assistance. Dr. Wise remarks, this explains the numerous precepts of hygiene, which we find in the sacred works of this most ancient people, and which necessarily vary in their nature with the climate and character of the people. In the sacred works, these laws are so numerous that it is impossible that any single individual should follow them—a fact much to be regretted, since the climate requires so much more attention to hygiene than a more temperate one.

The Assyrians had no profession of medicine. They exposed their sick in public places, in order that passengers might communicate their experience as to cure. Egypt, after having had her institutions destroyed by the sword of the conqueror, became the seat of Grecian learning which, was afterwards transferred to the East, where, under the fostering care of the caliphs of Bagdad, medicine was cultivated with diligence and success. It received still further additions from the East; and thus improved, it was conveyed by the Mahomedan conquerors into Spain, and from thence to other parts of Europe. Before Hippocrates, there were treatises on hygiene, which that great master evidently embodied in his incomparable works, in which he shows a clear conception of the relation between the amount of food taken, and of the mechanical agency produced by it. Mr. McKenzie, in his treatise on health, remarks: "Herodicus, one of the preceptors of Hippocrates, was the first to introduce medical gymnastics, for the improvement of health, and the cure of disease, though gymnastics in the training for war had been used long before. Plutarch says of him: that labouring under a decay which he knew could not be perfectly cured, he was the first who blended the gymnastic art with physic, in such a manner as protracted to old age his own life and the lives of others afflicted with the same disease. He was censured by Plato for keeping alive persons with crazy constitutions. Dr Gillies, in his animated description of the Olympic games and gymnastic exercises of the Greeks, says: "Bodily strength and agility were accompanied by health and vigour of constitutions.

Their athletic hardiness bore, without inconvenience, the vicissitudes of cold and heat Even the scorching heat of July—for that was the season of the Olympic games—they received, bare-headed, the direct rays of the sun. And the firm organization acquired by perpetual exercise, counteracted that fatal propensity to vicious indulgence too natural to their voluptuous climate, and produced those inimitable models of strength and beauty, which are so deservedly admired in the precious remains of Grecian statuary. There is a courage depending on nerve and blood which was improved to the highest pitch among the Greeks." Since the first medical observations, that are now extant, were made and recorded, various new species of human maladies have, there can be little doubt, made their original appearance; for instance: *Small-pox*—The first account of which is given by Gregory, of Tours, as showing itself at Pelusium, about the year 544, and thence spreading over Egypt, Syria, and the rest of Asia Minor. *Measles*—The first indisputable records of true epidemics of this disease are furnished by Forest, 1563; Lange, 1565; Ballonius, 1574, and Schenk, 1600. *Whoopingcough*—The first well-established accounts are derived from Schenk, 1650, and Baillou, 1600. Again, some diseases which prevailed formerly, seem to have now entirely disappeared from among the human race. The English sweating sickness, the black death, the bubo plague of Florence, Milan, and other cities, and the variety of leprosy that prevailed, more or less, over all Europe, from the tenth to the fifteenth century, are almost entirely unknown as native endemic diseases. The western European continent has not been visited by the disease since the serious epidemic which occurred in Provence, in the years 1720 and 1721. In the present century, plague epidemics have occurred principally in south-eastern Europe, and particularly in the countries bordering on the lower Danube, and the Black Sea, and also in the Balkan Peninsula. In the more western European countries epidemics have occurred only in three places, viz.: in Malta, 1813; in Noya, in Lower Italy, 1815. Since 1841, Europe has remained free from the plague. Recent outbreaks of epidemics of plague since 1871, in Persian Kurdistan, have impressed the medical world with the fact that it is still an active disease in the Ottoman and Persian dominions, and the actual appearance of the disease, in an epidemic form, in south-eastern Russia, has shown that the warning given of a certain danger therefrom to Europe itself, was not uncalled for. A most graphic account of the frightful ravages of this disease in Florence, in 1348, is to be found in Boccacio's introduction to his admirably told tales in his great work: The Decameron. An equally graphic account of the plague of Milan will be found in Manzoni's Promessi Sposi. In Great Britain, state, or preventive medicine, was carried out most stringently in the olden times, particularly with regard to leprosy. Various authors have alleged, that the institution of leper hospitals and laws for the seclusion and separation of the infected were formed more from imitation of the Levitical institutions regarding the leprosy, than from direct observation, and proofs of the contagious character of the disease. The avoidance, however, and separation of the sick have been recommended and followed by authors, and by communities over whom the Levitical laws could have exercised no influence direct, or indirect, and to whom indeed these laws were, in all probability, totally unknown. Most modern pathologists are inclined to call in question the contagious nature of leprosy, as it at present exists in different parts of the globe, and that even in the middle ages it was really of the intensely contagious nature supposed, may perhaps be called in question, from the fact that in history we find cases of rich and noble doctors endeavouring to expiate their sins and propitiate the good will of Heaven by devoting themselves, and with perfect impunity to such duties to the sick as offered the most certain means of calling down the disease upon their own bodies, provided it had been at all so contagious as was generally supposed. St. Louis (IX.), of France, visited the leper hospitals every month personally, rendered the most abject services to their inmates, fed them, and washed their sores with his own hands. Henry III., of England; Robert II., son of Hugh Capet, and Queen Matilda, of England, performing with impunity the same work. The contempt and loathing of them, seems to have been proverbial, as late as the age of Elizabeth. Thus, Shakespeare makes Margaret of Anjou exclaim to the suspicious Henry V., after the murder of his uncle, the Duke of Gloster:

> "Why dost thou turn away and hide thy face?
> I am no loathsome leper; look on me."

The late Sir James G. Simpson, in addition to profound knowledge in every branch of medicine, had great antiquarian tastes; and from three papers, entitled, Antiquarian Notices of Leprosy and Leper Hospitals in Scotland and England, read before the Medico Chirurgical Society of Edinburgh, I select extracts bearing on the subject. Sir James does not enter into the extensive history of the leprosy of the middle ages, as seen in the different quarters of Europe, but confines himself to the provisions made by the State for its limitation in Scotland and England.

The three first lazar, or leper houses—spitals, spetels, or spitles, corruptions of the word hospital—are Aldcambus in Berwickshire, Aldnestum in Lauderdale, and Kingcase in Ayrshire. Others followed in Glasgow, Edinburgh, Aberdeen, Rothfern. In the year 1350 the Lady of Lochow built a leper house at the Gorbals of Glasgow. Some were founded much earlier—even more than two hundred years before the Glasgow institution. These hospitals were not, of course, like modern ones, numbering their inmates by hundreds, and so much was the necessity for isolation considered a duty and safeguard to the community that there were about one hundred leper hospitals in England and Scotland, which were under strict regulations, and the most stringent rules were enacted to prevent the sick from mixing with the well. In some, under certain precautions, the inmates, on certain days, were allowed to leave to buy provisions. In others the inmates were punishable by death if they left the hospitals, and, to emphasize this regulation, a gallows was erected in front of the leper house. In the Burgh Records of the Glasgow Leper House for 1573 we find that the then magistrates ordered four persons, supposed to be lepers, "to be viseit, and, gif they be found so, to be secludit of the toon, in the hospital at the Beig End." In the Parliament held at Perth in the year 1427, the following is a clause from an Act then passed: "That na lepper folk sit to theg—viz: to beg, neither in kirk nor in kirkyard, nor in other places within the burrowes, but at their ain hospital and at the fist of the towne, and other places outwith the burrowes." The Act afterwards tells us who were the then sanitary inspectors. The third clause is as follows: "That the Bishops, Offichalles and Deanes inquire dilligentlie in their visitation of ilk paroch kirk, gif one be smitted with lepper, and gif ony sic be found in that, they be delivered to the king; gif they be seculares, and gif they be clerkes to their Bishoppes; and that the Burgesses gar keep this statute, under the pain intimet in the statute of beggars; and qhat leprous that keepes not this statute, that he be banished forever off that burgh, ghair he disobeys, and in likewise to landwart." The Scottish Parliament in 1366 enacted: "Gif ony man brings to the market corrupt swine or salmon to be sould, they sall be taken by the bailies, and incontinent, without ony question, sall be sent to the lepper folke, and gif there be no lepper folke, they sall be destroyed all utterlie." Certainly a most wise provision on the part of those ancient legislators for the safety of those of their lieges unaffected with leprosy, but of very questionable humanity to the unfortunates, so diseased.

Rank of the persons attacked by Leprosy.—In Great Britain this disease seems to have had its largest share of victims in the lower classes of society, amongst the *Villeyns*, or bondsmen of those times. That the rich and noble however were occasionally the victims of the disease, Sir James Simpson furnishes abundant evidence: The Mayor of the City of Exeter, a gentleman of noble parentage being infected with leprosy, notwithstanding his great wealth, submitted himself to a residence in a leper hospital, where he lived many years and finished his days. Some of the English leper hospitals were specially founded for the reception of leprous monks alone; the youngest son of the Earl of Leicester was a leper, and in the reign of Richard II. founded a leper hospital. Different historians have alleged that Henry IV. was a leper; Baldwin IV., King of Jerusalem, and King Robert Bruce of Scotland. In mediæval times, the state regulations for the sequestration of persons stricken with plague, were quite as complete and stringent as for leprosy. The sick and their families were obliged to remove out of town; their friends under the charge of an officer could visit them after 11 o'clock; any one going before that hour was liable to death. The houses were cleaned, and the clothing of the infected was boiled in the open air; the parties who discharged these duties, and those who were employed as bearers of the dead, were obliged to wear a grey gown, with a white St. Andrew's cross before and behind. The bier was covered with a black cloth, with a

white St. Andrew's cross. A bell was also attached to it so that it might ring as it passed along to warn any person to get out of its way. In September 1584, the authorities of Aberdeen built forts to prevent the entrance of people, who mightbring in the infection. This does not appear to have been successful, for we find that in May next year, the magistrates erected gibbets, one at the nearest cross, another at the Brig of Dee, and the third at the Haven Mouth, that "in case any infected person arrive or repair by sea or land to this burgh, or in case any indweller of this burgh receive, house or harbour, or give meat or drink to the infected person, the man to be hangit or the woman to be drownit"—the distinction of punishment presumably intended as an illustration of the chivalry of the age for the fair sex. "If from the sanitary enactments in Scotland, we turn to similar legislative measures in mediæval London, including not only acts of Parliament but also civic ordinances" remarks Dr. Tripe, in a lecture delivered two years ago before the Society of the Medical Officers of Health, "we should almost wonder at the prevalence of the plague, sweating and other sicknesses which more than decimated the population from time to time, as well as the large fires which so frequently devastated portions of the city. The laws and ordinances in existence at that time ought to have prevented both, but they were generally neglected, and at the most, only spasmodically enforced (just as it happens in Canada, in times of epidemics only) for they had the power, and rarely used it, of condemning houses that were from a hygienic point of view uninhabitable, and removing many of the nuisances which materially affected the comfort, if not the death rate, of the people of England. An ordinance was issued in the first year of the reign of Richard I. (1189) known as Fitz-Elwynnes Assize of Buildings, containing many important regulations, not only as regards the structure of buildings but their appurtenances. Thus it was ordered that the party walls of new houses should be made of stone three feet in thickness. That if the expense were borne equally by both the land was to be taken equally from both, but if the neighbour of one wishing to build were too poor, or objected, the latter was to give three feet of land for the other to build on, when the wall which was raised 16 feet high became their joint property. Careful enactments also for the carrying off water from buildings on to the highway are to be found. The interior of the smaller houses, as described by Chaucer in his "Canterbury Tales," were filthily dirty, not only from the want of chimneys but from the habits of the people, and in the better class houses, although there were glazed windows and chimneys, yet the floors are described as being filthy in the extreme. Although sewers are mentioned by Fitz-Stephen as being in use at the time at which he wrote, which was in the reign of Richard I., yet he probably meant merely the channels in the centre of the streets which communicated with other channels leading to the Thames; nothing was allowed to be thrown out of the windows between sunrise and nine at night, under a penalty of three shillings and four pence. There were also divers other ordinances as to pent-houses, rain-gutters, jetties, stalls, cellars and pavements. The oath taken by the scavengers was to the following effect: 'You shall swear that you shall diligently oversee that the pavements within your ward are well and rightly repaired, and not made too high as nuisance to your neighbours, and that the ways, streets, and lanes are cleared of all manner of filth, and that all chimnies, furnaces and reredoses are of stone, and sufficiently defended against peril of fire, and this you shall not fail to do, so God help you, and the Saints.'

In the twelfth year of the reign of Richard II., butchers were allowed to erect slaughter-houses on the banks of the Thames, but this was repealed in the 16th year of the same reign, when butchers and others were prohibited from throwing offal into the river under a penalty of forty pounds. A similar enactment passed in the reign of Henry VII., showing that the convenience of killing beasts in the city had prevailed over the law. In the reign of Henry III., twenty-first year, liberty was granted to Gilbert Sanford, to convey water from Tybourne by pipes of lead. The earliest attempt to supply water by mechanical means was made by Peter Morris, who carried pipes into the houses on the Thames side of Grace-church Street. The pressure was sufficiently strong to throw water over St. Magnus Church, and was obtained from the Thames in 1582. The laws against vendors of food who sold tainted meat, poultry, fish, etc., were very severe. Thus we read in the Liber Albus of persons being put in the pillory for selling putrid meat, tainted capons, rabbits, pigeons, partridges, fish and boiled meat, a similar punishment

was also inflicted on those who sold false shoes; pity that some such summary punishment had not been inflicted on some of the contractors during the Crimean war. It appears from the bills of mortality that most probably the deaths exceeded the births. Graunt, in his essay on the subject, states that the excess of deaths was very considerable, and was made up by immigrants, about 6,000 of whom came to London every yeer. The plague caused a very large number of deaths in the 12th, 13th, 14th, 15th and 16th centuries. It is reported that 100,000 died in London in 1352; 30,000 in 1401 and in 1499, and nearly as many in the various epidemics of this disease down to 1651. Graunt and other writers thought that with the exception of 1640 and 1660 when baptism was neglected or the entries not made, the baptisms may be taken as a near approximation to the births. It appears from the bills of mortality, that during the hundred years, 1601 to 1700 there were 1,572,635 deaths registered, of which as many as 188,571 were due to the plague, that there were only 984,499 christenings entered, but Dr. Tripe on a comparison of the years before and after the twenty years 1640-60, shows that at least 50,000 must be added to the total number to bring it up to the average; this would make 1,034,499 christenings, which with 25 per cent. added, makes up a total of 1,293,124, or an excess of deaths over baptisms amounting to 271,511. By these extracts from diligent inspectors of ancient records, which from their length I am afraid may have wearied you, I must sufficiently have convinced you that State medicine, instead of being a new departure of medical science, is merely a revival of regulations and enactments requisite for preserving public health, to be conformable however with the ideas entertained in modern times of the rights of the subject, necessarily less stringent ones. If we were to employ at the present time only one-half of the energy expended in former days against infectious diseases, many ailments which now commonly take on the character of an epidemic would be expelled from our soil. There is to be found, however, on record at least one instance of apparent rude cruelty in modern times, equalling that practised by our forefathers for the prevention or spread of disease. When cases of plague occurred in the little town of Noya, in lower Italy, in 1815, troops were despatched immediately to surround the place with a cordon. The city was encircled by two deep ditches, and opposite the gates, these ditches were spanned by two draw-bridges, which served as a means for the introduction into the town, but no other communication was allowed. Only letters were allowed to leave the city, and these had first to be dipped in vinegar. Cannons were posted at the city gates. The ditches were occupied by sentinels, who were ordered to shoot down any one who approached, and did not stand still the moment he was hailed. A plague patient who escaped when delirious, and attempted to pass the lines, was actually shot dead. Those who disobeyed the orders were treated with the greatest severity. An inhabitant of Noya who had thrown a pack of cards to the soldiers, together with the soldier who picked it up, were tried by court martial, and shot. In the quarter of the town where the plague first appeared, and was the fiercest, 192 houses were burned, or torn down. Lower Italy and Europe probably owed their protection from the plague to the severity practised in this particular instance. Such extreme measures were probably the result of a traditional knowledge of the devastation produced by the plague in Florence, Milan and other Italian cities, where it was computed that fully one half of the inhabitants were destroyed. An epidemic called the Black Death, which occurred about the middle of the fourteenth century carried off 14,000 of the population of Basle. From this disease, at Venice, three-fourths of the inhabitants are said to have died, the remainder only escaping by flying to the islands. In Germany more than a million of lives fell a prey to the scourge, and in England, according to statements possibly overdrawn, scarcely one-tenth of the inhabitants were left. It is said that reliable statistics place the total loss of life from the Black Death in all Europe at from one-third to one-fourth of the population; in Asia it is probable that it was even more considerable. The causes that have operated in modern times to break the force of epidemics, have been the great advance in civilization, and the improved sanitary condition under which we live, in the providing of pure air, pure water, pure food, proper sewerage, and due disposal of sewage.

From Hollinshed's description of England in the middle ages, and Strutt's complete view of the manners and customs of the people of England from the arrival of the Saxons, it would appear that the hovels of the poor were close and unventilated, and the dwellings

of the rich, even, anything but conformable to our modern notions. That the practice of bathing was forgotten after the Norman conquest. That there was a want of fresh meat and vegetables; that chimnies to dwellings were an innovation as late as the beginning of the sixteenth century; that there was general personal uncleanliness. Arnott, in his History of Edinburgh, mentions that it is recorded as a wonderful exception to this, that the Archbishop of Glasgow actually put on a clean shirt once a week. That the straw bedding was never changed. Hollinshed describes this hard lodging with seldom any sheets under their bodies to keep them from the pricking straws that ran oft through the canvas, and raze their hardened hides. Add to these factors of disease the crowded tenements in cities, where the streets were so narrow that the inhabitants could hold conversations with their opposite neighbours; deprived of a sufficiency of sun-light, badly fed, poorly clothed, and often herded together like cattle, and there is little cause for wonder that the efforts of the State at arresting pestilence were attended with so little result. Even in the present day, in the full light of advanced sanitary science, the mortality from infectious diseases forms a large proportion of the total mortality.

In 1844 the inhabitants of New Brunswick were under great apprehensions that a terrible contagious malady, the Tubercular Leprosy, or Lepra Græcorum, prevailing in the counties of Gloucester and Northumberland in the Province of New Brunswick was likely to spread among the inhabitants. The Government issued a commission to investigate the nature of the disease, and a critique on the Report issued by the Medical Commission appeared from the pen of Dr. Alexander Boyle. The first case occurred in the person of Ursule Landre nineteen years after her marriage with Joseph Benoit. Father, mother, and nineteen children were perfectly free from the disease. It was not proven that she commuuicated the disease to anyone, either by direct contact or through the medium of substances imbued with a contagious principle. She was married in 1799. The disease appeared nineteen years after marriage, and ten years before her husband contracted it from her, for he continued free from it until three years before her death, and ten years free from it after she had shown all the symptoms. A number of other cases are passed under review, all tending to show that the disease was hereditary, not contagious. From 1817 to the time of report, nineteen confirmed cases were found at the time of visit of commissioners. Ursule's father and husband were of Norman descent, as also the inhabitants of the district. Henry II., Duke of Normandy, erected a superb structure at Caen in 1160, for a leper hospital, now long since appropriated to other uses. This attests the prevalence of the disease there in former times. The Acadians, so called, originally settled in the Bay of Chaleur, and it is well known that the north shores of Acadia were the places where these adventurous navigators first encountered perils. There is little doubt that the disease was brought by their remote ancestors to these shores, and sprung up again among their posterity, who appear still to inherit the original taint.

At the time that chemistry was being imperfectly studied by the alchemists, an entirely different school of preventive or state medicine arose. The discovery of chemical agents and the great effect they produced on the body led to the notion that they could in some way aid the forces of life, resist the incursions of disease, and insure a prolonged, if not an eternal youth, and a life of ages instead of one of years. This belief, the natural result of the discovery of new powers, has not yet entirely died out, and while there are some who still look to every fresh agent as possibly containing the balsam of life—Hop Bitters, St. Jacobs Oil, Vegetine, Pierce's Discovery, and numerous other catholicons, for instance—there are also still enthusiasts who search the mystic forms of the alchemists or the Rosicrucians, or through mesmeric media rely on relief from obscure ailments that have escaped the ken of physicians *not* among the illuminati, in the faith that, after all, the great secret *was really* found. Life was looked upon by the alchemists as an entity, or principle, liable to constant waste and to eventual expenditure. If some agent could be found to arrest the waste, to crystallize, as it were, the tissues in their full growth and vigour; decay, it was conceived, would be impossible, and youth would be eternal. Geber, an Arabian physician, who lived in the seventh century, is one of the earliest alchemists, whose works are extant. He treats of the medicine, tincture, elixir, or stone of the philosophers in general. Dr. Johnson supposes that the word gibberish,

anciently written gebberish, was originally applied to the language of Geber and his tribe —an unflattering supposition, it is true, but one that you will probably concur in. The most clebrated alchemists who wrote on the Elixir of Life and Philosopher's Stone for the transmutation of the base metals into gold were Albertus Magnus, Raymond Lully, Roger Bacon, Arnoldus de Villa Nova, Flammel, Basil Valentine, and Paracelsus, the boasted possessor of the Elixir of Life. As a chemist, though probably the ablest of his time, he falls far short of Basil Valentine. His original discoveries, says Brande, in his Manual of Chemistry, are few and unimportant, his great merit lying in the boldness and assiduity which he displayed in introducing chemical preparations into the Materia Medica, and in subduing the prejudices of the Galenical physicians against the productions of the laboratory. But, though we can fix upon no particular discovery on which to found his merits as a chemist, and though his writings are deficient in the acumen and knowledge displayed by several of his contemporaries and immediate successors, it is undeniable that he gave a most important turn to pharmaceutical chemistry, and calomel, with a variety of mercurial and antimonial preparations, as likewise opium, came into general use. He professed a belief in magic, and boasted of having received letters from Galen, and of having disputed with Avicenna in the vestibule of the infernal regions. Among his principal mystic notions were those of an internal illumination, an emanation from the Divinity, the univerral harmony of all things, the influence of the stars on the sublunar world, and the vitality of the elements, which he regarded as spirits, encased in the visible bodies presented to our senses. These are, says Hallam in his Literature of Europe, the Sylphs, the Undines, or Nymphs, the Gnomes, and Salamanders. It is thus observable that he first gave these names which rendered afterwards the Rosicrucian fables so celebrated. Paracelsus, thus armed with mercury, opium, and antimony, remedies of no trifling importance, travelled in all directions, and performed many extraordinary cures. In 1526 he was chosen to be Professor of Medicine and Natural Philosophy at Basle, the first professorship established in Europe for the promotion and dissemination of chemical science. In consequence, however, of a dispute with the magistrates about the amount of a fee which he demanded of one of the canons, he left Basle in about a year, and recommenced a wandering life, generally intoxicated, seldom changing his clothes, or going to bed. After passing through many vicissitudes this drunkard and prince of empirics, the boasted possessor of the elixir of life, *died* like other mortals at Salzburg with a bottle of his immortal essence in his pocket. Chief among the modern Rosicrucians it to be reckoned Cagliostro, the most impudent and successful imposter of his time. In 1780 he settled with his wife, a woman of great beauty, at Strasburg, where the *soi disant* Count practised as a physician, and pretended to the art of making old women young. As his handsome wife, who was only twenty, vowed she she was sixty and had a son a veteran captain in the Dutch service, they for a time obtained a good deal of practice among the old women of Strasburg. Thence they went to Paris, where Cagliostro exercised the profitable profession of Egyptian Free Masonry, as he called it, pretending to the power of showing people the ghost of any of their departed friends. In 1785 he was deeply implicated with the Cardinal Duc de Rohan in the notorious affair of the diamond necklace, in which the name and fame of Marie Antoinette, the unfortunate Queen of France were concerned. He was, in consequence, shut up for nine months in the Bastille; and on his expulsion from France, went to England, where, during a stay of years, he found no lack of credulity. The people of England have been accused of possessing a larger share of credulity than those of other countries. It has been called the paradise of quacks—but with as little truth as candour. Witness the rapid spread of spiritualism, at least for a time, in the United States—of the modern craze of the universal application of electricity in disease, and of other equally ephemeral and baseless doctrines. Credulity diffuses itself through the minds of all classes—is not confined by any means to the uneducated.

The great lexicographer, Dr. Johnson, when asked whether he considered spectres to have a real existence, replied, "This is a question which, after five thousand years, is still undecided." Probably, therefore, the arguments of Imlac in *Rasselas*, which aim at the proof of spectral reality, may be considered as Dr. Johnson's own views. The first practitioner of mesmerism in England received one hundred guineas for a course of

lectures, and fifteen guineas for a consultation and the imparting of its influence. It is recorded that Dr. Elliotson mesmerized a sovereign by merely looking at it, and that a girl who intuitively selected it from a heap of others was instantly struck with coma; and Van Ghest records the case of Mademoiselle B., who, when magnetised, assured him that while she was intently looked upon she felt her eyes and brain to leave her head and become fixed in her stomach, in which situation she saw acutely, *but*, if she was in the slightest degree disturbed, the eyes and their senses seemed to return. De Lauterbourg, a renowned professor of mesmerism, is said to have had three thousand people attending his seances. Credulity would therefore seem to be as prevalent in the present century as in the days of Paracelsus. Having now alluded, at as great a length as the limits of a lecture would permit, to the preventive medicine of ancient times, as also to the various enactments on the same subject in mediæval periods, and having briefly alluded to the reasons why these various epidemics were so frequent and so fatal, viz., the compression of the population in faulty habitations, ill-contrived and closely packed, with narrow streets, often made winding for the purpose of defence, a very poor supply of water, and therefore a universal uncleanliness, populations of rude, careless, and gross habits, living often on innutritious food, and frequently exposed to famine from their imperfect system of tillage, and in the case of walled towns surrounded by deep moats, impure atmosphere, and a deficiency of sunlight. I now pass on to a hurried review of hygiene, as understood and practised in modern times—understood, but *not* always practised, for notwithstanding the more intelligent appreciation of the nature of diseases and increased knowledge of prevention, communities have been criminally slow in putting in practice the necessary means. Nearly three-quarters of a century passed in England after the discovery of the means of preventing the scurvy before they were sufficiently appreciated to be used in the Royal Navy, after long years of representations to the Government of the day by Sir Gilbert Blain, notwithstanding that in Commodore Anson's voyage around the world fifty per cent. died from the disease, whilst Captain Cook, in his three years' voyage, with an abundant supply of lime-juice and a diet of vegetables and fruit, lost not a single case. Little more than a century ago the prisoners confined in gaols in Europe were decimated by Typhus Fever. The philanthropist, John Howard, cleansed the wards, properly fed the prisoners, drained the grounds, and thus effectually, by putting in practice the laws of hygiene, prevented the spread of infectious diseases; laws not even universally observed or believed in at the present time, as only a few years ago, from an English pulpit, the idea was advanced that the severe epidemic of Scarlet Fever then raging in London was a visitation from God for the sins of the wicked metropolis. Notwithstanding, however, these occasional evidences of neglect, of proper appreciation of causes of disease, for the last third of a century, more persistent efforts than ever before have been made to improve the health of the people; the social economist has outdone the novelist in his computations of the suffering and misery, the waste and loss to society arising from Smallpox and other epidemics that might have been avoided, and the statistician with his estimate of twenty to twenty-eight cases of illness for every death has added *his* warning. Much has been already done, human life has been prolonged, diseases that were formerly common have disappeared, while others have materially diminished, all from attention to hygiene. The minute and persistent work of Drs. Chadwick, Farr, Southwood, Smith, Simon, Richardson, William and Alfred Carpenter, Buchanan, Thorne, and a host of other English, American and Continental sanitarians have added ten years to the average life of the people. Referring to the result of these beneficent labours in England Lord Macaulay says: "The difference between the salubrity of London of the nineteenth century and the London of the seventeenth century is far greater than the difference between London in an ordinary season and London in the height of an epidemic of Cholera. That two hundred years ago men died faster in the purest country air than they now die in the most pestilential lanes of our cities and towns." In the present day there is almost a universal consensus of opinion among the members of the medical profession all over the world that a large number of diseases are preventible, and that under proper regulations when they did occur they might be quickly stamped out. To whom, then, does it belong to search out causes, and to determine the proper measures for antagonizing them?

Certainly in an especial manner to *Local Boards of Health,* including in membership a sanitary engineer, and at least two or three members of the medical profession. Every Local Board should have in addition a medical health officer. The duties appertaining to the office in cities would, if thoroughly attended to, leave little leisure for practice; the remuneration should therefore be commensurate.

The sanitary information that may be distributed under the authority of a Provincial Board of Health will be but of partial benefit in educating the general public to prompt and effectual action on the outbreaks of epidemic disease. This work can only satisfactorily be accomplished by Local Boards possessing as they do an intimate knowledge of the special characteristics of their own communities. They, therefore, are the best fitted for selecting and using the methods by which published information concerning infectious diseases shall be forced on the attention of all classes, and the value of the work of the Provincial, will be dependent upon the fidelity with which the Local Boards of Health give it wide circulation, and secure the execution of measures the information may indicate as necessary. As I have already, I fear, gentlemen, exercised too severely your patience on the first two branches treated of in this paper, and my colleagues are to follow on various subjects pertaining to the practice of modern hygiene, I will, in conclusion, very briefly allude to results obtained within the last sixty years from the labours of the distinguished men I have mentioned as prominent in this great work, and leave to those who succeed me the task of expatiating on the minute requirements necessary for obtaining satisfactory results, not only in hygiene proper, but also in the most important work of statistics. I have, I trust, in the narrative of the methods employed by governments in ancient and mediæval times for the arrest of epidemics and improvement of public health, sufficiently demonstrated the main object I had in view, viz., that the exercise of State regulations was not only imperatively called for, but also justifiable, and that for the arrest of epidemic diseases private liberty must be made subordinate to the welfare of the public at large. That the cost of a great epidemic in lives, prolonged illness, diminished labour supply, etc., where there has been a neglect of proper precautions on its first outbreak, has been so enormous, that to prevent a repetition of such calamities infringement on personal liberty is fully warranted. That the burthen of sanitary improvements must rest upon property, *i.e.*, the owners to provide dwellings fit for human habitation upon sufficient superficial space, with a due supply of wholesome water, and with all necessary structural means of preserving health, under penalty for non-fulfilment of obligations, and no sale or lease of property should be permitted excepting on certificate of the city sanitary engineer that all needful requirements had been complied with. The records of English, American, and Continental Boards of Health furnish abundant evidence of the practical benefits growing out of the observance of sanitary laws. In the eighteenth century the death-rate in London was 50 to the thousand; in the nineteenth it was reduced to 24. I select from a few districts in England the death-rate per thousand in every ten years, from 1840 to 1850, from 1850 to 1860, and from 1860 to 1870. In North Witchford in 1850 the death-rate was 27 to the thousand, in 1860 it was 21, and in 1870 it was 20. In Wiltshire in 1850 it was 28 per thousand, and in 1870 it was only 20. In Essex in 1850 it was 24, and in 1870 it was 18. In Warwick in 1850 it was 27, in 1870 it was 21. In Devon in 1850 it was 26, in 1870 it was 20, and so on for a great many other counties. The health of vast masses of population have been beneficially affected by works of reclamation, which are now to be seen in all parts of the world. Marshes, from which used to spring fatal agues and malarias, are now to be seen converted into fruitful and wholesome fields and farms, and the death-rate of the United Kingdom during the last ten years has so notably decreased that 300,000 lives have been saved, which would have been lost had the death-rate of the preceding decade continued. With such favourable results following organized work, the Provincial Board of Health cannot too strongly urge on every city and municipality in Ontario the early establishment of Local Boards of Health.

It is to be well understood however, that no sanitary improvement worth the name will be effected whatever acts these boards may pass, or whatever powers they may confer upon public officers, unless they can succeed in creating not only a real and intelligent interest in the matter among the people at large, but also a willingness to submit to the

ordinances judged to be essential for the preservation of the health of the several localities, and one of the first steps for forming universally in the future correct public opinion in regard to the important subject of Hygiene, is to provide for its teaching in all schools. This is practised in France and other countries in Europe, as also in many of the neighbouring States, where lectures on Hygiene, by members of the State Board of Health, as also by laymen interested in the subject, discussions on sanitary subjects, are in addition to school teaching of frequent occurrence. The benefits, then, that a Provincial Board of Health can confer, are comparatively trifling as contrasted with the important work pertaining to Local Boards, such as the insisting upon immediate notification to the Medical Health Officer of the Board, of cases of infectious disease, and if proper accommodation cannot be obtained in the patient's own dwelling, the immediate removal to a special isolated hospital, to be provided for by the Board at its inauguration; if the provision is only hastily made on the occasion of an outbreak of an epidemic, it is very apt to be badly suited for the object in view. Second, the providing for the disinfection, by a properly appointed officer, of the clothes, bedding, furniture, etc., also of the dwelling-house, removal of wall-papers and lime-washing. Third, the conduct of interments of persons dead from infectious disease. Fourth, the careful watching of persons or families who have been exposed to infection, and their detention for a sufficient time for observation. This vigilance to be especially exercised with regard to school children in whose houses cases of infection have occurred. There are many other subjects which would occur to members of Boards as called for by the particular exigencies of their municipality, therefore unsuited for general notice. Whilst in England last summer, I had frequent opportunities of conferring with the Medical Officers of the Local Government Board of Health on sanitary matters, and, before leaving for Canada, received from Dr. Thorne his most valuable report on contagious diseases, in which the great value of isolation hospitals for the arrest of epidemics, is most exhaustively treated on; a very brief allusion to the use and influence of these institutions may not be out of place. From this report it appears that in 296 sanitary divisions, either by isolated hospitals of their own, or by an understanding with the neighbouring one, provision was made for the reception of persons labouring under infectious diseases, who could not be treated at their own homes with safety to the inhabitants of the towns or villages where the cases occurred. The question having arisen whether the neigbourhood of these hospitals for the reception of infectious diseases only was a source of danger to the inhabitants, Dr. Buchanan, the chief Medical Officer at Whitehall, appointed Dr. Thorne to collate, for the assistance of sanitary authorities unprovided with isolation hospitals, the experience of those who had under comparable circumstances provided their districts with such hospitals. As respects other infectious diseases than Smallpox, *i.e.*, Scarlet Fever, Typhoid, Typhus, etc., Dr. Thorne has no record of their being spread from these isolated hospitals to the surrounding neighbourhood. With regard, however, to Smallpox Dr. T. records two instances where infection had appeared to spread from a hospital in a row of houses in a way that suggested conveyance of the infection matter through the atmosphere, rather than by means of persons or things, but in no other instance was he able to obtain any evidence of extension of Smallpox infection to neighbouring streets or houses, in spite of the best enquiries that he and officers before him could make. Dr. Thorne's enquiries, however, had been limited to the Provinces, and when at the end of 1880 representations were received by the Local Government Board that cases of Smallpox were occuring round certain of the Metropolitan Asylum Hospitals, it was held that Dr. Thorne's provincial experience could not be accepted as representing the whole truth for hospitals for London, and accordingly Mr. Power was associated with Dr. Thorne for the particular object of investigating the facts for the neighbourhood of Fulham. Mr. Power's investigations were extended over a long period of time, were most minute and exhaustive, and the conclusion arrived at was to the effect that during the specific periods in January, 1881, and probably during former periods, there has arisen in the atmospheric circumstances of the time peculiar facility for the dissemination, in an undamaged state, of any matter that may have been given off from the hospital. With the possibility of these atmospheric circumstances frequently prevailing, it is obvious that the safety of the citizens demands the location of Smallpox hospitals at a considerabie distance from habitations, the opinion of many eminent authorities to

the contrary notwithstanding. A few more words in conclusion ; in a Dublin paper of the 19th of last month, I read last evening an abstract of a lecture delivered by Professor Cameron, Health Officer of that city, before the Ladies' Sanitary Association, the audience being large and fashionable ; subject of the lecture, "Site and Basement Stories of Dwellings—Enemies to be Kept Out—Underground Damp, and Underground Air." Why should not the ladies of Canada follow the example of their Dublin sisters. Great influence may be exercised by women in connection with Hygienic reform, because it is to women that we must look to the exerting of home influence. Women should be great Hygienists. "It is to the wife, not to the husband, to the mother, not to the father, that we must look for the careful preservation of hygiene in the home. It is to the mother, not to the father, that we look for the prevention of disease among the children, and for the adoption of those hygienic measures which will lead the children to grow up in vigour, health, strength and beauty, and fitted in mind and body for the duties of after life."

"Healthy Homes."

(An Address by Dr. Oldright, delivered by request of the Hamilton Association, 27th March, 1883.)

Mr. Chairman, ladies and gentlemen,—When the Secretary of the Hamilton Association asked me to arrange for a series of papers to be read under the auspices of this Association, the conclusion mutually arrived at was that they were to be of a popular character ; that they should serve to open discussions of a practical nature, and should assist in the work of diffusing sanitary knowledge amongst the community at large—a work in which, we understand, our Hamilton brethren have engaged, by the reading of similar papers.

Hence, the chief object of this paper will not be to present new scientific facts and theories of an abstruse character, but rather to point out the particulars in which many of our homes fall short of that degree of healthfulness which they might attain—to make more plain the modes of action and the baneful consequences of certain unsanitary conditions, and to suggest remedies therefor, many of which, no doubt, may be at once put in operation by the individual householder.

People become so habituated to conditions under which they have been accustomed to live that unless these have become very perceptibly bad to the senses they are apt to consider attempts to improve them—when we come to practical details—as proceeding from the whims of those who are making a hobby of sanitary science. And, of course, so long as they have this feeling they will not enter heartily into plans for the improvements referred to.

One of the first things we have to do, then, in connection with this subject is to cause people to feel that there are, in the vast majority of homes, conditions which can be brought very much nearer to a high ideal standard ; and that the certain result of bringing them towards that standard will be a vast improvement in the health and vigour of of the inmates, and a diminution of the mortality and sickness rates.

In this endeavour we can bring to our aid statistics, which will be referred to when we come to consider certain details in connection with ventilation and sunlight.

But a more powerful conviction can be obtained by a direct appeal to the acknowledged and evident results of living under the conditions of our standard. And what is that standard? The fresh, pure country air on a bright June day, such as we so often have in this fair Canada of ours. I have used the term "ideal standard," meaning one towards which we should strive. We cannot fully attain it unless we live outdoors, in some spot removed from the haunts of man. The results to which I have referred are well-known and acknowledged. The family doctor advises that his little pale-faced patient be "kept out of doors as much as possible every fine day ;" and we all know what a contrast there is—other things being equal—between the man who is employed out of doors and him who is no less actively employed in the factory or warehouse. I need hardly say that the

contrast is strongly in favour of our standard, and that a little consideration will convince anybody of it. I have not overlooked the fact that in making comparisons of this kind, other elements often enter, such as change of scene and freedom from care; but I have purposely used the words "other things being equal." Let the work of the man employed out of doors be as exacting or as monotonous as that of the in-door man and he will still have the advantage. It seems almost superfluous to insist on this point, but it is necessary to do so, in order fairly to give our in-door atmosphere its true character, and to impress upon our minds the fact that it is susceptible of vast improvement, and that we ought to cause it to approach as nearly as possible the condition of that pure outside air of a temperate summer day. In pursuance of our object, we must consider :—

1. The differences that exist between the atmosphere of houses, as we generally find them, and the ideal atmosphere we wish to approach.

2. The results produced on the inmates of the houses by these differences, and the reasons of these results.

3. The difficulties to be overcome in approaching our ideal, and the best means of overcoming them.

1. The differences between the air of many houses and our ideal atmosphere.

The atmosphere out of doors, as we find it on such a day as I have referred to, is pure, normal air, at a temperature between 65° and 75° F., and either brightened by the direct rays of the sun, or by those rays, softened by some leafy screen, or fleecy clouds.

Absence of Sunlight.—In many of our houses we find, as a first point of difference, that the sunlight, in its diffused as well as its direct form, has been reduced very greatly in amount—sometimes carefully excluded altogether. This is sometimes due to defective architectural plans: the person who has planned the building having contrived to have the windows of the rooms, which ought to be well lighted, so situated that they are carefully shut out from the face of the sun. This was the case in a certain gaol in which I often had to be—(on professional work of a legitimate character). The hospital window, or the window of the room intended for the hospital, faced north, and was most effectually barred, by a projecting wing, from even a glimpse of the rising or setting sun.

Again, we may have allowed a most commendable admiration of stately trees or love for vine-clad bowers to grow, like them, to excess, and shut out and usurp from us that beneficent light which should be shedding its benign influence within our homes.

Most commonly, however, this absence of sunlight is due to the fact that, for the sake of carpets, pictures and other adornments, the windows are kept zealously shrouded by blinds and shutters.

In hot weather, too, our housekeepers are tempted to exclude the sunlight on account of its warming influence.

The difference of temperature between our standard air and the air as it often does exist outside, and as it would tend to exist inside, are the source of much trouble in connection with ventilation. We have just seen how a high temperature tempts to closing blinds and windows; and in cold weather it limits the rapidity with which fresh air may be admitted. In fact ventilation and warming must be considered together. When we have low temperature, unless we have proper contrivances, we often have to choose between very cold air and impure air, and, as our feelings are more affected by the former, we generally choose warmth and impure air.

Indeed it is strange to observe how difficult it is to get many people to understand the difference between coldness and purity of the air, or between heat and impurity : to understand that cold air may be foul. I suppose that many of us have often, when complaining of the foulness of the air, been answered: "Indeed; why, I was feeling chilly."

Impure air.—What, then, are the differences found in this *impure air*, of which we often have to make choice?

You will remember that pure air consists of about 20.61% of oxygen, 77.95% of nitrogen, 1.40% of water, .04% of carbon dioxide, and the little balance of about .02% of various other matters; so that you will see there is very little room left for organic vapours, and the carbon and sulphur compounds, and that the amount of them in pure air must be very small indeed I have referred to these three groups or classes

of impurities because they are those which are most baneful in their effects, as ordinarily met with in our dwellings.

A consideration and understanding as to how these are produced amongst us, and in what amounts, will the better enable us to understand our duty in regard to them, in view of the further consideration which we have to make of their poisonous results.

(*a*) *In breathing, or the act of respiration*, carbonic acid (carbon dioxide) is largely produced, and, along with it, a noxious organic vapour more injurious to life than the carbonic acid; but inasmuch as the two maintain a pretty constant ratio, and the amount of the carbonic acid is the most readily determined, we generally measure the combination, and regulate the amount of it which may be tolerated, by the amount of carbonic acid it contains. It has been found by direct experiment that, taking the average, a healthy adult gives off 6-10 of a cubic foot of carbonic acid per hour. I may be allowed here to anticipate another division of my subject by saying that it has been ascertained by experiment also, that six parts in 10,000 is the limit of the measure of carbonic acid in this admixture of injurious gases of expiration with the normal air, which may be allowed to exist in our dwelling-rooms, with a due regard to the fullest requirements of health. So that you will see, from a little arithmetical calculation, that to maintain this standard, each man should have 3,000 cubic feet of fresh air allowed to him. In this calculation you must remember that four parts of carbonic acid in 10,000 already exist, so that only two parts in 10,000 may be added by respiration.

(*b*) *The combustion of coal and wood fires* also gives off carbonic acid and a gas much more deleterious—carbonic oxide—containing twice as much carbon in its combination as carbonic acid. To its effect I shall refer again.

Coal and wood also give off other compounds somewhat less injurious, the sulphur compounds from coal being very sickening and disagreeable.

(*c*) *Lights* use up more fresh air and give off more injurious compounds than is generally supposed. It is computed that an ordinary gas jet vitiates as much air per hour as two men; and coal oil more in proportion to the amount of light produced.

(*d*) *Emanations from the soil* over which houses are constructed contribute their quota to the combined impurities.

Houses are built over, and their foundations sunk into, soil containing a large amount of organic matter. What is known as "made soil" is specially objectionable in this regard. The evolution of organic matter from such soils is largely aided by the ascensional force created in the house. But on this I will not dwell. I may remark, however, that the existence of cellars under houses is not, as a general thing, to be recommended as conducive to health. Yet some people take the air for heating purposes from the cellar. Seldom is proper care taken to ventilate the cellar. In all cases, where practicable, outside root-houses should be used instead of cellars.

The soil of back yards, saturated with slops and other filth, gives rise to impurities which enter our homes.

(*e*) *Our imperfect drainage system* also frequently allows of the ingress of sewer gases into our houses; and not only are these gases injurious in themselves, but they may convey the germs of diseases, such as typhoid and scarlet fevers, diphtheria and cholera. But on these contagia I will not dilate, as I believe they will be dealt with by the gentleman who is to follow me this day two weeks.

(*f*) For the same reason it will not be necessary for me to do more than allude to the *air of sick rooms* and the impurities contained therein.

(*g*) *Wall papers* add to the impurities in the air of our homes. Arsenical and other poisons are given off from them.

(*h*) One other point of difference is the *amount of moisture* contained in the air. Our methods for heating the air cause it to lose most of its moisture.

I have thus described as fully as time will permit the more common differences between the atmosphere of our dwellings and that out doors on the day we have chosen. Let us now turn to consider:—

2. The injurious effects of these differences, and how they produce these effects.

Effect of absence of sunlight.—The higher forms of animal life, no less than the gher forms of vegetable, require the influence of the sun. In some way it exerts a vital

action essential to the proper development of the blood. Who would expect to see a rose bloom in all its beauty in a cellar? What would result in it results more slowly in human beings. I believe the condition of our houses assists in producing the strikingly large amount of the anæmia which figures so prominently in our disease reports.

The absence of light also tends to produce diseases of the eye, which I will not have time to discuss.

It also favours the development of moulds and other low forms of organic life.

Impure air.—I do not intend to discuss the effects of impurities resulting from some special features in trades, which do not apply to us in our homes. And whilst this is partly the case with coal miners, inhaling particles of coal dust, still the imperfect ventilation not supplying a sufficient amount of oxygen, and not carrying off the impurities caused by respiration and by lights has a so much greater part in the mortality that occurs amongst these men that I have thought it well to read some statistics, given by Dr. Parkes some years ago, of the mortality in Yorkshire amongst miners, as compared with that occurring amongst those males who do not work in the mines:—

Ages.	*Death-rate of miners.*	*Death-rate of non-miners.*
15–25	3·40	3·97
25–35	6·40	5·15
35–45	11·76	3·52
45–55	23·18	5·21
55–65	41·47	7·22
65–75	53·69	17·44

It will be seen that for the first ten years the miners have the advantage—perhaps, because only the most robust youths would be sent to work in the mines. And this leads me to answer, in passing, the remark that is often made by sceptics in sanitary matters—Why do we find such healthy, strong men amongst scavengers and others engaged in offensive and unwholesome callings? I would answer by another question—Would you expect to find delicate men engaging in such callings? But to return to the miners. We find after the first ten years a highly increased and increasing death rate amongst them.

Amongst soldiers and sailors in times of peace, and amongst the inmates of poor-houses similar statistics have been given, especially in connection with deaths from pulmonary consumption.

(*a*) *The air, rendered impure from respiration and transpiration,* is robbed of a large amount of oxygen, which has been replaced by carbonic acid and other impurities, and hence the vital changes produced by oxygen on the blood and tissues are interfered with. In addition, such air contains a large amount of organic impurity, and in some cases germs of disease, which make it additionally injurious.

(*b*, *c*) *Fires and lights* also rob the air of its oxygen, and act in this way similarly to animal respiration.

They also add to the air some injurious gases, such as carbon monoxide, hydrogen sulphuret, etc., and various other carbon, sulphur, ammonia, and other compounds. Of these the carbon monoxide is the most injurious in its effects. It is said to take the place, volume for volume, of oxygen in the blood, and is supposed to exert a destructive action on the red corpuscles.

I saw, a short time ago, an account of some melancholy cases of poisoning in your own city from an escape of gas, largely composed of carbon monoxide, from a stove. In Toronto, last New Year's morning, I witnessed similar cases, which, however, did not terminate fatally. The blue flame, tipped with yellow, noticed when a gas jet is turned too low, indicates that this compound is being evolved. The turning down low of a coal-oil lamp is no saving of coal oil, and is a fearful waste of good air.

(*d*, *e*) *The emanations from decomposing organic matter* of made soils, drains, polluted yards or cesspits may give rise to specific diseases, if even a small number of the germs of these diseases have been deposited in the soil, drains or pits, or thrown out in slop water on the surface of the ground.

Or the result may be a gradual deterioration of the general health, manifested by some such symptoms as headache, nausea, want of appetite, general *malaise*, want of vigour;

and persons are thus rendered more liable to succumb to the invasion of epidemic or other diseases.

(*f*) I need not at present dwell on the symptoms of arsenical and lead poisoning, which are frequently produced by *wall-papers.*

(*g*) *Lack of moisture* gives rise to distressing dryness of the nostrils, throat, and air passages generally, leading sometimes to bronchial and catarrhal affections.

3. The difficulties to be overcome, and some of the means of overcoming them.

(*a*) In remedying most unsanitary conditions we will generally find women most ready to assist; but in regard to the *absence of sunlight* an exception must be made; they are, in fact, the delinquents in this matter, and it is the men who strive to be the reformers. The ladies are not Persian in their proclivities: they are not sun worshippers. But if we appeal to their motherly hearts in behalf of the pallid little inmates, and point out the cause of some of the pallor, they will sometimes be prevailed upon to sacrifice the colours of a rich carpet or the gilding of a handsome picture on the altar of health.

(*b*) The great difficulty which underlies the whole question of sufficiently diluting the impurities necessarily generated by the act of respiration and by fires and lights, is that of providing a sufficient supply of air of a suitable temperature, and of so introducing it that it shall not produce injurious draughts.

A prior difficulty is that people, generally, are not acquainted with certain principles, such as the amount of impurities given off by respiration, heating, lighting and other processes, nor the amount of air required to dilute these impurities, nor how often or how rapidly the air may be changed in a room, and consequently the size which the room must be, nor certain other principles to be observed in bringing in the fresh air and taking off the foul. Nor do they generally know how to test whether the air is sufficiently pure and moist, nor whether the appliances in operation are sufficient, or wherein they fail, for these are two distinct lines of investigation.

It may be helpful to throw what is known on the subject into a few briefly expressed propositions, which will lead us up to some practical results, and which propositions may be expressed somewhat as follows:—

Air rendered impure by respiration and by fires and lights is injurious on account of the absence of oxygen and the presence of certain organic, gaseous, and other impurities.

Carbon-dioxide is generally found to maintain a pretty constant proportion to these various impurities, and hence the amount of it will form a fair index to the injurious or wholesome character of the air.

It has been found by experiment and observation that a proportion of 6 to 8 parts of carbon-dioxide to 10,000 of air is all that can be tolerated without producing bad symptoms, such as headache, loss of appetite, etc.; and to be safe, it seems from the experiments performed that 6 in 10,000 is all that should be allowed.

The amount contained in normal out-door air is about 4 in 10,000, and hence the amount that may be added will be only 2 in 10,000. It is known that the average healthy adult gives off about $\frac{6}{10}$ of a cubic foot of carbon-dioxide per hour. To bring $\frac{6}{10}$ of a foot to the proportion of 2 in 10,000 requires about 3,000 feet. This will then be the amount of fresh air required hourly to dilute to the standard proportion the impurities from respiration of each average individual. Dr. Parkes lays it down that, as a rule, the air of a room cannot be changed more freqnently than three times per hour. The absolute air space should then be about 1,000 feet per individual. But air which is of a suitable temperature before it is introduced might be changed more frequently; in other words, if we introduce warm air we can do with a somewhat smaller air space. If we can change five times per hour, 600 feet will answer, but it is not often that we can do this.

The next point is, through what sized openings, and how distributed, this air may be passed into the room. Our bodies are at a temperature of $98\frac{1}{2}°$ F., but air warmer than 70° would be unpleasant to us. Now, to let air at 70° impinge rapidly and continuously on a body of $98\frac{1}{2}°$ would cause such a local fall of temperature as would act injuriously: whilst air between 65° and 70° surrounding us allows us to part with our superabundant

animal heat, still it would create an injurious draught if allowed to impinge rapidly upon us. Hence, we must see that our openings are of that size that they will not, on the one hand, allow too much air (if it is not warmed) to enter, and, on the other, that they will allow enough to come in without making too swift a current. It is found that 5 feet per second is well borne, and for 3,000 feet to enter at a rate of 5 feet per second we would require an inlet space of $\frac{1}{6}$ of a square foot, or 24 square inches. This may be divided between several openings, and broken up as it enters. We must always bear in mind that there are chinks and openings for the passage of air, and that even the walls are somewhat porous, and that all this will help the openings purposely made for ventilation.

Having now decided the amount of air required per hour, the number of times air may and can be changed in a room, and, as a consequence, the size of air-space per individual in the room, and the size of the openings through which it is to enter and leave, we have next to consider the positions of inlets and outlets, and the methods (if any are necessary) for breaking up and distributing the incoming air.

We cannot speak of "*the*" plan of ventilation: temperature, both as influenced by the season of the year and by the mode of heating, the size and shape of the room and other varying circumstances, will require various modifications in the position of inlets and outlets, and in regard to other points in ventilation.

There are *certain general principles*, which, if applied after a careful consideration of the circumstances of a given case, will assist very materially in determining the means of ventilation. These may be stated as follows:

1. *The air supplied should be of a suitable temperature and proper degree of moisture when it comes in contact with any portion of our bodies.*

2. *It should be evenly distributed throughout the whole of the air space.*

3. *It should be pure.*

4. *Hot air is lighter than cold, and its tendency is to ascend.*

Our time will not allow us to consider all possible cases and means of ventilation; but let us apply these principles to some of the more common and general conditions.

Let us take the case of *a dwelling room in summer time.* The only source of heat here is the animal heat from the bodies of the inmates. The temperature of these is about 98½° F. The atmospheric temperature is nearly always less than this, generally very much less. Hence the warmest air in the room is that which has been breathed by the inmates, and it is this warm air which will ascend, and the best thing to do in this case is to make outlets at the top of the room, and let it fly up and away as speedily as possible.

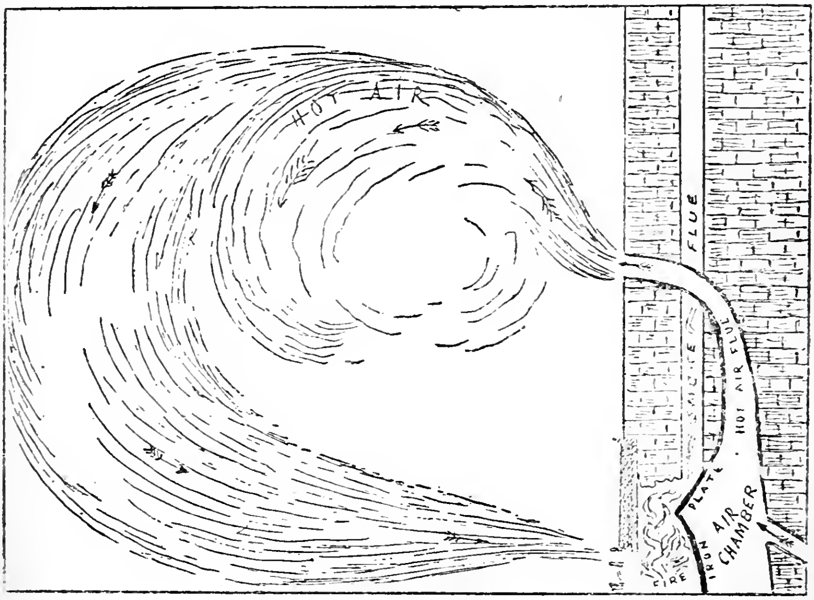
Now compare this with the case of *the same room in winter time,* with the atmospheric temperature below freezing point.

It will be evident that in order to get *pure air* it must come from outside, but it must be made of a suitable temperature,—it must be warmed, either before it is brought into the room, or by a heating body in the room, and in this latter case it should be brought directly in contact with the heating body by some such contrivance as a tube carrying it to a stove surrounded by a metal jacket, as described at page 151 of the First Annual Report of the Provincial Board of Health. Now, what about our outlets? If in this case, too, we place the outlets at the top of the room the pure air brought in, as soon as it becomes heated and suitable for us, is carried off at the top of the room, to which part it rises. The correct method here, then, is to place the mouths of our outlet flues at the bottom of the room, not to run directly outside, for then they will be cold air flues and the cold air may pass through them, even descend through them. Whilst the openings into the flues should be at the bottom, the flues themselves must run up in the warm room and open up above to discharge in the outside air. If they are in proximity to a heated chimney, all the better. A chimney flue itself may be utilized—a fire-place, either used or unused. The draught of the stove acts in this way. It may be further aided by the following simple contrivance in a room where there are no flues constructed for the purpose. Take a three or four inch rain pipe, connect it with the stove pipe, and run it down into the corner of

the room. It may be blackened or painted, as desired. The draught passing up it will be rapid, and if necessary more than one such tube may be introduced.

In this method of ventilation the fresh portions of heated air constantly rise to the ceiling, and that not so recently heated falls in fountain form to take the place of that which is drawn off from the bottom, forced downward, too, by the more recently heated portions first referred to, constantly rising from the heating body.

A very good contrivance for introducing pure heated air, and carrying off the foul air, is that devised by Capt. Douglas Galton, in connection with an open fire-place, to which the name of the Galton Grate has been given. The construction is somewhat similar to that shown in the following illustration:



Cold air passes from the outside of the building by a small flue into the "air chamber" at the back of the fire, from which it is separated by an iron plate. From the upper end of the chamber the now heated air passes by another flue into the apartment at a point between the mantelpiece and ceiling. It rushes into and across the room. At the same time the fire itself is drawing the air which has been used, from the floor and up the smoke flue. We thus have not only an excellent sanitary appliance, but a great economizer of heat.

Let those who are building houses or putting in new grates take a note of this.

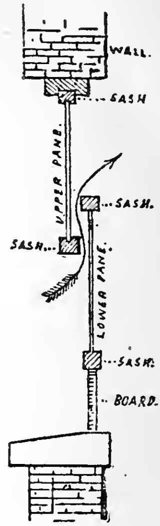
When hot air is forced into a room, another factor has to be considered—namely, the velocity and force with which it enters, and the consequent distance to which it will be impelled. Time will not permit us to discuss at length at this time the details of particular instances. Care must be taken to see that the inlets and outlets are so placed that the air has to traverse the whole space before passing from one into the other. It may be stated in general terms that numerous bottom outlets will be found to give the best results, for dwelling rooms.

In closing my remarks upon the means for removing the impurities in the air by ventilation, I shall enumerate the various *contrivances for inviting, directing, breaking up, and distributing currents of air* entering dwellings. Their necessity is almost limited to rooms where cold air enters, so as to break up the draught.

1. Having a piece of board nailed onto the top sash of the window, slanting upwards, to direct the current in that direction.

2. Raising the lower sash and filling in the space left under it by a piece of board,

as shown in the accompanying diagram. The air gets in through the space left between the lower part of the upper sash, and the upper part of the lower one.*



3. A board placed just inside the lower window frame will act in the same way when the latter is slightly raised.

4. Placing wire screens in spaces of entrance of air. Sometimes they are tacked to the window frames and folded up when the windows are closed.

5. By louvred openings.

6. By double panes, with an open slit at the bottom of the outside one and at the top of the inside one, thus giving an upward current.

7. By various perforated and louvred bricks, such as the Sheringham valve, and Jenning's air brick.

8. By a box running from side to side across the ceiling of the room, and perforated with numerous small openings. Sometimes a diaphragm is placed to divide it midway, thus making both inlet and outlet.

9. By perforated cornices running around the room.

10. By Tobin's tubes, which are flues, bringing fresh air from out doors and rising up from the floor, discharging it upwards at a slight distance overhead.

McKinnel's tubes and the ordinary double tubes I need only allude to, as they are more applicable to large public halls than to "Healthy Homes." For the same reason I will not describe ventilation by fans, pumps, furnaces, steam jets, and other "artificial" methods.

Any portion of an outlet flue situated out doors will draw better if it is blackened, so as to be acted upon by the sun. Cowls on ventilating flues will also aid in producing stronger currents.

It might by some have been considered unnecessary to say, as one of our general principles, that "*The air supplied must be pure.*" Yet in how many houses are there provisions for bringing it directly from out doors, and through flues which are periodically cleaned, and not from cellars, halls, and other places, where it has been rendered impure? Hot air furnaces are frequently fed through air boxes containing dust and rubbish.

We shall not have time to discuss the methods of determining the purity of the air of our homes, and the sufficiency of the means of ventilation. But, I would like to remind you that we may form an approximate *test by the senses* if we come into a room fresh from the outer air and notice the condition of the atmosphere. When persons remain for some time in a room their senses become so habituated to the closeness or impurity of the air that they cannot judge properly of it.

I will also briefly refer to a table which may be found in some works on Hygiene, "*Dr. Angus Smith's Popular No-Precipitate Table*," which shows the amount of carbon dioxide indicated by the milkiness produced in one-half ounce of lime water or baryta water when shaken in different sized bottles of air. The smaller the bottle of air which will produce this the more impure is the air. This is a rough but convenient method of determining this question.

(c) Impurities from lights.—It is found that an ordinary gas jet destroys about twice as much air as a man, and unless we have a contrivance for carrying off the products of combustion, it will require twice as much air and air space. A shade of tin or other suitable material suspended over the gas jet, with a tube running up from the apex of it, will not only convey away the impurities of the gas, but will cause it to aid in the ventilation of the room. The tin shade will also act as a good reflector. This plan would be a good one in all houses; but in printing offices, and in other establishments where a large number of lights are being used, it seems an absolute necessity for the sake of health.

I have before said that oil lamps are even more injurious in proportion to the amount of light produced. When they are kept in fixed positions, a similar plan may be adopted in regard to them.

(d) After what has been said about *poisoning from stoves*, it ought to be hardly

* This same method is also referred to in a paper read by Mr. Dearness at the London Convention, and a front elevation illustrative of it may be seen on page 344 of this Report.

necessary to say that greater care should be exercised. I may here remark that slow poisoning is not uncommon from this cause—manifesting itself in headache, nausea, loss of appetite, want of energy, etc. If base-burners must be used, they ought to be overhauled every season to see that the joints are tight, the mica plates impervious, the flues clean, etc. Those who attend to them should be carefully taught regarding the use of the dampers : front draughts to be more frequently closed to check heat, and back ones not closed, when by so doing gas is given off. It is supposed by many that cast-iron stoves are more pervious to the passage of gas than sheet-iron.

(e, f) [Time only allowed of a few remarks being made regarding impurities from *sewer gas and soil pollution*, and as the modes of dealing with these are fully discussed in papers by Dr. Oldright, and other gentlemen, published in this Report, they will be omitted here.]

(g) We often err in not having *sufficient moisture* in the air of our houses. Enough and too much is indicated when we find it being deposited on the cold window panes. When the deposit commences we can lessen the moisture-producing process. The lack of moisture has much to do with the production of bronchitis, and other affections of the air passages. In summer there is no difficulty, but in winter people are apt to forget that by artificial heat they are drying out the air. There are some, again, who think that in heating by steam pipes and hot water pipes no lack of moisture can occur. It is not necessary to do more than point to the fallacy by which they are thoughtlessly deceived, and to say that steam and hot water inside the pipes do not impart moisture outside of them.

I have occupied so much of your time in describing some of the influences which tend to detract from our "healthy homes," the manner in which they do so, and the remedies to be employed, that I have no time to attempt anything beyond the plain matter of fact I have been serving out, even had I been able to offer something more interesting to your fancy. I trust, however, that our evening has not been an unprofitable one, and I would now conclude by thanking you, Mr. Chairman, ladies and gentlemen, for the attention with which you have listened to my remarks.

Zymotic Diseases, their Nature, Methods for their Prevention and the Results Thereof.

(Address delivered before the Hamilton Literary Association.)

Mr. Chairman, Ladies and Gentlemen,—In choosing a subject upon which to address you this evening, I found some difficulty in deciding what I should select. This is due not only to the fact that the two gentlemen who have already delivered lectures in this course have chosen most important sanitary questions on which to speak ; but, also, because a number of lectures, by myself, on sanitary subjects have already appeared in the Annual Report of the Provincial Board of Health, or have had extended references made to them in the public press. In an address delivered before the Mechanics' Institute of Galt, in October of 1882, I spoke concerning the "Causes of, and methods for, the prevention of typhoid fever." To those who may be aware of the nature of typhoid fever, it will not appear strange should they find in my paper to-night, ideas, in some respects, similar to those of that address, as published in the Annual Report. But, I trust that, while my remarks to-night will be found to cover the question of the causation of enteric fever, they will be found to have embraced the wider subject of zymotic diseases in general.

Referring to the history of zymotic diseases, I need hardly say that not only were many of this class of diseases epidemically present many centuries ago, but their contagious or infectious character was also known then as well as now. Who has not heard of the plague which, in the fourteenth century, beginning in China, moved westward spreading over Asia, Europe and Africa, destroying, it is said, in Europe alone, under the name of the black death, some 25,000,000 people? It would seem as if, with the advance of the semi-barbarism of mediæval times, in which most of the knowledge of

physical laws gained by Jews, Egyptians, Greeks, Romans, and Arabs was lost "the people sank to the lowest depths of sanitary neglect from which the powerful voices of plague, typhus, and cholera were the first to arouse them." With such evidences of the Oriental pest—which still lurks, it is said, in the valley of the Euphrates—as the fact already stated, or of its effects in even one locality, as given by Montaigne of the outbreak in Bordeaux, which killed 18,000 out of 60,000 inhabitants, causing the town to be so deserted as "that grass grew in the market places; the rooks and ravens came into the towns and built in the belfries, and silence was universal," it is truly marvellous that men were so slow in gaining any definite knowledge of either the causes of such diseases or of the methods for their prevention or cure. Without insinuating a word against all that was good and healthful in the religious beliefs of those mediæval times we cannot but assert our conviction that the recourse to those who, as the leech in Sir Walter Scott's "Betrothed" says, were responsible for the deranging of physical practice with their petulant prognostics, their rash recipes, their mithridate, their febrifuges, their amulets, their charms, and the invocations to mysterious powers, were some of the principal obstacles to the study of nature in such directions as would have been fruitful in discoveries of the real causes of the many diseases which, as we have seen, were so fatal to mankind. Occasionally, in the past, we see such as Francis Bacon, William Harvey, and more recently, Jenner, with earnest gaze, looking deep into the mysteries of nature; but, for the most part, the people in the past centuries seem to have been helpless, and like the untutored savage, to have ascribed all to the potent agency of some evil spirit, or to have bowed in superstitious fear to what seemed *a visitation of God.*

It is my purpose to-night briefly to describe some of the results of the labours of men in the field of what has become known as the science of Biology, or what, on its medical side, is the study of the etiology of what are called zymotic diseases. But, further, having examined the questions of the etiology of zymotic diseases it will be proper to advert to the methods which have been, and are being, adopted for their prevention, and to some of the results which have flowed from such means.

The fact that certain diseases are propagated by contact, or by a healthy person being in the atmosphere of a room in which has lain some infected individual, seems to have long ago impressed itself upon the minds of the observant and thoughtful, since as far back as the first century B.C., we are informed by a Latin author "that marshy places are to be avoided, because in them certain minute animals grow, and that these cannot be perceived by the eye, but being carried into the air, enter the body through the mouth and nostrils, and so produce serious diseases;" while the cry "room for the leper, room!" is significant of the fear men had of coming in contact with such as were infected with this then so prevalent disease. Men had, doubtless, in those olden times a shrewd suspicion that the danger in this disease arose from the scales on the body of the leper; but how such could produce the disease must have been quite beyond their powers of explanation or comprehension. The phenomena of contagious diseases have, however, been ever too present to allow of the question of their real nature being dropped, and the unravelling of the tangled web of mystery surrounding them has slowly, and with many interruptions, progressed—every successive thread which has been freed making the remaining work always grow more easy. Hence it is that the last forty years have seen such a marvellous advance towards the solution of this most perplexing of problems. Doubtless the means for its solution have hitherto been very imperfect; but the perfection of chemical processes and microscopic methods have been, and will yet be still more, that by which we shall be enabled to see clearly into the "intervital gloom."

It seems a self-evident truth that ere we can either understand or discuss the methods proper for the prevention of these diseases we must have some accurate idea of what their real nature is. That the real nature of these diseases is as yet far from being thoroughly understood may be illustrated by the following incident: About two years ago I had been requested to assist in an *ovariotomy*, one of the most dangerous of surgical operations. During the operation the question of the value of antiseptic precautions came up for discussion. Several medical gentlemen were present, and, amongst other remarks, I remember one made by a surgeon, an able operator, to the effect that it was about time that the nonsense talked about antiseptic surgery was coming to an end.

This occurrence happened to be shortly after the famous German surgeon Esmarch had spoken at the International Medical Congress, and had, while acknowledging the value and scientific correctness of the principles of Listerism, objected to some of the minutiæ of dressing, etc., as being troublesome and unnecessary. The assent which several present gave to this opinion convinced me that they were far from possessing any accurate knowledge of the biological facts underlying the principles of Listerism, or such assertions would not have been either expressed or assented to.

The term *zymotic* first proposed by Dr. Farr, Registrar-General of England, is commonly used merely as a synonym for preventible, comprehending all the diseases which have prevailed as *epidemics* or *endemics;* but, as remarked by Blyth in his sanitary dictionary, "it will be advisable to confine the term to infectious or contagious non-parasitic diseases in which there is a multiplication, a zymosis or fermentation caused by some active principle in the body."

It is in this sense that, as an accurate scientific term, it is now used. We understand it to be applied then to such a disease as has, or is supposed to have, been caused by something having been introduced into the blood of either men or animals, which acts there much in the same way as does the *mother of vinegar* when placed in a sugar solution. A zymosis or fermentation has, we say, been set up. Now, in the case of the *acetous* fermentation, it needs no great microscopic experience to prove that certain minute cells of a particular and special character are always present, arranging themselves after a certain fashion and comporting themselves in various ways, according to circumstances. For instance, M. Duclaux remarks:—"These little cells (beings) reproduce themselves with such rapidity that by placing a single imperceptible germ upon the surface of a liquid contained in a vat (say in a malting-house) having a surface of one square mêtre, we may see it covered in from twenty-four to forty-eight hours with a uniform velvety film; or in this short time some 300,000,000 of beings have been developed."

We know further that, with this development of life, a chemical change has taken place in the fluid. It will in fact have become sour. Now supposing it to have been a solution of grape-sugar we would have obtained the following chemical re-action:— $C_6H_{12}O_6 + O_4 = 2C_2H_4O_2 + 2H_2O + 2CO_2$.

We thus see that the change has resulted from the addition of oxygen. Had such a solution been deprived of oxygen or air, we would have found that but few germs and but little acid would have been formed. Much the same result would have been seen had some cells of the alcoholic ferment been placed in the same solution. This would have been altered chemically, the sugar becoming changed into: $C_6H_{12}O_6 + O_6 = C_2H_6O + 3H_2O + 4CO_2$. We have here the same facts, too, that had oxygen been absent neither the cell development nor the chemical change would have to any extent taken place. In fact, these solutions would have been kept largely *aseptic.*

Now it has been largely from the studies of Pasteur on the *alcoholic* and *acetous* fermentations, and of Davaine and Hallier upon the causation of *charbon* or splenic disease in sheep that analogies have been made, and comparisons instituted between the causes underlying fermentation on the one hand and the splenic disease or *anthrax* on the other. Thus in the blood of victims of this disease have been found not only certain microscopic rods or filaments, slender, and formed usually of a single cell, long, flexible, immovable or active, but also that by being injected into the blood of healthy sheep these *bacilli*, as they are called from their rod-like form, produce the disease in its full intensity.

All will most readily perceive that it has been most natural for biologists recognizing the intimate relationships existing between the fermentation on the one hand in the alcoholic and sugar solution, and on the other in the blood of the sheep, to have applied the same term, zymotic, to the two classes of phenomena.

For the sake of thoroughly understanding the relations which biologists have established amongst these microbes or microscopic beings, it will be well for us to speak somewhat in detail of this class which have been placed in the botanical family of *Cryptogamia* or *flowerless* plants, and in recent works have been, as a class, called the *Bacteria*, from the fact that many of them are similar in shape to a rod or staff of which *bacterion* is the Greek equivalent.

As long ago as 1675, Leeuwenhoeck discovered, while examining a drop of putrid water with his magnifying glasses, that it contained a multitude of little globules which moved with agility. Soon after this he noticed similar beings in excrement and in the tartar of the teeth.

In 1841 Dujardin called these little beings "filiform animals, extremely slender, without appreciable organization and without visible locomotive organs." We thus see that even at this recent date the position of these little beings and the part played by them had been but little studied, understood or appreciated; nor was it until the researches of Pasteur, Hallier, Davaine, etc., had been made that the attention of chemists and pathologists became especially directed to this group of organisms.

This study within the past fifteen years has advanced with marvellous strides, and to-day we find classifications drawn up and many species accurately defined.

As viewed by biologists, Bacteria are classed as vegetables since they have a cell-wall composed of cellulose, and a semi-fluid, transparent protoplasm or bioplasm, within this, containing granules and vacuoles at times, the granules in some instances appearing coloured as by chlorophyll. Various forms have been placed under the class of Bacteria for some special reason, but in most cases their form as they have appeared under the microscope has been the most important character. Though first the name was applied only to rod-shaped bodies its scope has been extended; and now as to

A. *Form* we have

1. Rounded forms. 2. Cylindrical forms.

Billroth has divided rounded forms into

(*a*) Micrococci,
(*b*) Mesococci,
(*c*) Megacocci,

while the cylindrical forms have been variously named as

(*a*) Bacillus or Bacterium proper—inflexible rod.
(*b*) Vibrios—or rod-like but flexible.
(*c*) Spirilla—elongated spirals.
etc., etc.

B. *Dimension* has been used in classification, as seen in Billroth's *Cocci*. Thus we have

(*a*) Monas Vinosa = $\left\{ \begin{array}{l} 0.5 \text{ to } 1\ \mu \text{ wide.} \\ 3 \text{ " } 4 \text{ " long.} \end{array} \right.$

(*b*) Beggiatoa = $\left\{ \begin{array}{l} 7\ \mu \text{ wide.} \\ 10 \text{ to } 40 \text{ long.} \end{array} \right.$

C. *Structure* has also been applied to classification—

(*a*) Colourless or without chlorophyll,
(*b*) Coloured or with "

while some have been noticeable by containing sulphur granules, etc.

D. *Modes of occurrence* have been important means of classification—

(*a*) Unicellular—as micrococcus, monas, etc.
(*b*) Grouped—as Torulas.
(*c*) Zooglea.

Now, however, most of these methods of occurrence are admitted to be applicable to most of the various species.

E. *Modes of reproduction* have formed a basis of classification. Thus—

(*a*) By fission—Bacteria have from the fact of all multiplying especially by this method been called *Schizomycetes*.

(*b*) By germination—or budding, or by spores. This latter is now admitted to be found in various forms, as *bacilli*, and is apparently indicative of most permanency both in life and qualities.

F. *Physiological functions* have, finally, been adopted as a basis of classification. Thus some live at high temperature, some at low; some require one fluid for their ready propagation, some require another; some require much oxygen, others can live with but little, and so on.

As will be readily understood from these various characters, Magnin remarks with much reason that "the characters which may be used to establish classifications upon are of small number and of unequal value." Nevertheless, Sachs, Nageli, Cohn and others have made various classifications having much in common.

The following are the principal genera (as given by Magnin) :—

A. *Sphaerobacteria*—Described by Cohn as ferments, not producing fermentation, but substitutions of another kind.

B. *Microbacteria*—

1. M. Zymogenes { M. Crepusculum.
   " of stingy wine.
2. " Pathogenes { " Vaccinæ.
   " Diphtheriæ.
   " Septicus.
   " Bombycis.
   " Variola.
   " Rugeola.
   " Scarlatina.
   " Diarrhœa.

C. *Desmobacteria* (*Bacilli of Miquel*)—Filamentous in shape, isolated or in chains—

1. Bacillus—slender and short.
2. Leptothrix—slender and long—on vegetables.
3. Beggiatoa—thick and broad—on sulphur waters.
4. Cladothrix—articulated distinctly—
   (*a*) B. subtilis—Butyric ferment.
   (*b*) " anthracis—Charbon.
   (*c*) " ulna.

D. *Spirobacteria*—

1. Vibrio—short, slightly sinuous.
2. Spirillum—spiral, rigid.
3. Spirochaete—spiral, long, flexible.

Origin of Bacteria.—Concerning the origin of Bacteria, scientific opinion has been divided to some extent, although at present the tendency is almost wholly toward one conclusion.

1. Some twelve years ago the opinions, as best set forth by Bastian of the University of London, to the effect that many of these were developed spontaneously or by *heterogenesis* was largely and extensively held. Some may remember the warm discussion carried on by him on one side and by Prof. Tyndall and M. Pasteur on the other.

2. Now, however, most scientists adhere to the germ theory or the zymotic theory of Pasteur.

3. This latter has a development in the belief that the innumerable microbes in existence are but different phases in the development of a comparatively few species whose life cycle has not yet been completely worked out.

Referring to the last two theories as being alone of any importance, it is sufficient to say that, even should the latter prove to be in many instances true, it cannot materially affect the practical inferences to be drawn from the germ theory in its relations to disease.

Dissemination of Bacteria in Air and Water.—This may be proved by various methods, such as : (1) Drawing by means of an aspirator, a considerable amount of air through packed cotton wool; (2) drawing it over slides covered with glycerine; (3) drawing it through distilled water; and, (4) by the condensation of the vapour upon refrigerating basins. Hence there exist in the washings of cotton wool, on the glycerine slides, in the distilled water, and in the condensed water, innumerable living forms which subsist upon organic matter either in the air or upon solids, whose particles have been carried into the air. Again, Tyndall has proved their existence in air by the dis-

persion of rays of light in an air-tight box supplied with a slit: and that when the dust, of which they formed a part, had settled the ray of light became invisible.

That these microbes exist abundantly in (1) water may be proved by allowing it to partially evaporate and then examining that portion left; (2) by filtering a portion and then examining the filtrates; (3) by a process just recently developed by Koch, of Berlin, which Dr. Angus Smith maintains will be of inestimable value in the question of water analysis. It consists in adding the water to be tested for germs to a solution of gelatine, and letting it be kept for a few days in a warm temperature, say 120° Fahr., when spheres of liquid gelatine will appear around points where germs have produced a disorganization of the gelatine.

Bacteria have been found, too, in the blood and tissues of animals, and according to some, have been developed in some cases spontaneously, and at others have been introduced either through the lungs, the stomach, or the skin.

Nutrition of Bacteria.—They are nourished by the absorption of food through their cell wall by the so-called process of endosmosis. Of course, they have to all appearance no organs, but they have been noticed to come in contact with a vegetable cell and remain by it for a short time, when the latter will be seen to have become to some extent shrunken; while I have frequently observed the bacteria present in an acetous solution attack, apparently, yeast cells at rest.

As to the nature of their food, Magnin remarks that from the point of view of the nutritive function they act everywhere according to the same laws. No matter in what medium they live, they must have water, carbon, oxygen, and nitrogen, as well as minute amounts of various salts.

The absence of water makes them inactive but they remain so for a long time without dying. They are, in the form of spores, especially tenacious of life. These latter resist dessication and high temperatures to a great degree, but they vary in these respects both according to their species and the point of development which they may have reached. Some live in fresh water and some in salt water and thermal springs; while some exist in animal, and some in vegetable, fluids.

We have seen then that Bacteria have individual differences in relation to nutriment; but all seem to have the characteristics of the lower orders of plants, such as the *fungi.* In other words, Bacteria absorb oxygen and eliminate carbonic acid. Cohn sums up the discussion on this point when he remarks "that the complete development of the *bacillus*, and, above all, its reproduction by means of *spores*, is only attained under the free access of air or oxygen."

The interesting fact has been noticed that an atmospheric pressure of 24 lbs. arrests their development, or even abundance of free air (Angus Smith), while pure oxygen exaggerates their activity, and, if it be under 5 to 6 of pressure, it destroys them in from six to twenty-four hours.

Ozone has been noticed to cause a definite and almost instantaneous arrest of movement in Bacteria; boracic acid has been proved to destroy them by depriving them of their oxygen, while carbolic acid of $\frac{1}{20}$ strength arrests their growth.

Artificial Cultivation of Bacteria.—Some of the most interesting facts connected with the life history of these forms have resulted from their artificial cultivation. With sufficient food to form protoplasm, they multiply with rapidity; but when this has been devoured they fall to the bottom of the fluid, where they accumulate motionless in a more or less abundant mass. If the circumstances for development are favourable, their rapidity of reproduction is incredible. Cohn says:—"Suppose that one Bacterium divides into two in one hour. That each of these again divides at the end of the second hour, and so on for twenty-four hours, they will then have amounted to more than 16,777,220 individuals." He further says:—"Let each have a diameter of $\frac{1}{1000}$ to $\frac{2}{1000}$ of 1 micromillimetre in length, at which rate a cubic millimetre will contain 633,000,000. At the end of two days the bacteria developed from this one individual would equal $\frac{1}{2}$ litre. Now, if we allow the average depth of the sea to be one mile, and to occupy $\frac{2}{3}$ of the earth's surface, the whole sea at the above rate of development would be filled with bacteria in five days. To make the truth of this statement conceivable remember

that a single mushroom, or fungus, often developes several millions of such cells in a single night."

We have already mentioned the fact of classifications of bacteria being built up, especially by Pasteur, according to the physiological functions exhibited by them. In other words, there seem to be required special circumstances and media for the development of special bacteria, and hence we obtain the phenomena of fermentation, putrefaction, infectious diseases, etc.

Thus the role played by Bacteria in non-nitrogenous substances is called fermentation.

The role played by Bacteria in nitrogenous, vegetable or animal substances, is called putrefaction or nitrification.

The role played by Bacteria in animal organisms, is called septicæmia.

But the special phenomena of these activities are as yet both too imperfectly understood and too complex to make it either possible or desirable for us to speak more extendedly concerning them. As for that particular portion of bacterial phenomena with which my subject to-night is especially connected I need say no more than that, while the results, as far as the exact localization of special microbes for each of our special zymotic diseases goes, have been to some extent contradictory, much seems definitely settled.

Thus Coze and Feltz have apparently determined the bacterium of scarlatina, of measles and of variola; Formad, Wood and Oërtel have cultivated the microbe of diphtheria; Klein, Pasteur and Coze have localized that of enteric, or typhoid fever; Klebs and Thomasi Crudeli describe for us the bacillus malariæ; Christot has recognised the bacterium of glanders; relapsing, or famine fever, has for its specific microbe spirochæte obermieri, etc.; and finally, Koch has, within the past year, given to the world his experiments, proving, with much show of truth, that consumption has its bacillus tuberculosis.

While some of these assertions may yet require further experiments ere they are proved, we have the specific characters of (1) charbon, in sheep; (2) cholera, in chickens; (3) glanders, in horses; (4) milzbrand, in mice, placed apparently beyond the region of doubt. Before leaving, however, this part of our subject, it is only fair that some of the difficulties in connection with the bacterium theory of diseases of a contagious nature be stated. It is very natural that, with the numerous difficulties connected with the microscopic and chemical experiments through which our present knowledge of Biology has been obtained, there should have been animated discussion and warm controversy between the upholders of different theories arrived at by different methods of experimentation. But such can only result in good; the dross will be purged away and eternal truth will remain. Some of these objections are those made to the zymotic theory of disease, as now advanced, by Dr. Lionel Beale, F.R.S., of King's College, London. (*Vide* paper on Typhoid, first annual report.) We there see that Dr. Beale's position has many points of strength in it.

Another difficulty, which all must confess is a formidable one, is that of determining the specific bacterium of each disease; since it has been found that the same microbe has been present at one time as the apparent cause of a most virulent disease, while at another, it is said to have been found present as a harmless being in an infusion of hay. Taking an illustration, the *Bacillus Anthracis* is to all appearance the same as the very common *Bacillus Subtilis* except that while the former is a motionless form, the latter is very active. Dr. Buchner, after many experiments, has announced that after cultivating the Bacillus Anthracis through several hundred generations in a fluid having free access to the air, it would no longer produce charbon when sheep were inoculated with it; that it now began to grow on the surface of the hay infusion and would grow in this infusion even though acid, which, in its primal condition, was fatal to it. In fact it has taken on all the characteristics of *B. Subtilis.*

The development of B. Subtilis into the B. Anthracis was then attempted. But, while, as will be easily seen, the process was more difficult, he has finally been able, by gradually lessening the amount of air to which the bacillus in cultivation was exposed, and by gradually substituting an animal for a vegetable infusion, to produce from the

harmless B. Subtilis of a hay infusion, microbes, which when inoculated, will produce charbon or anthrax in sheep.

It is needless to point out the importance of this discovery, if it be confirmed. It will prove not only that the environment, in other words, the nature and amount of nutriment, the amount of heat, moisture, etc., in which these simple organisms develop, affect to an almost unlimited extent their qualities, causing what at one time may be harmless to become virulent, and at another suggesting the possibility of reducing to an indefinite extent the malignancy of many of our most fatal forms of disease. This last has indeed been accomplished by Pasteur, etc., in what he has called the attenuation of the germs of *chicken cholera*, as well as in a less degree of *charbon*. Other objections to the germ theory have been raised, one of the most formidable of these being by Prof. H. F. Formad, B.M., M.D., of the University of Pennsylvania, against Koch's arguments in favour of Tuberculosis being a zymotic disease, which will be found summed up in a paper on Consumption by myself (*vide* Part III., Art. II., of this Report).

But, having examined some of the principal objections raised against the *Bacterium* theory, I must conclude by expressing my belief that the great bulk of proof, at present, is in its favour.

We have now come, ladies and gentlemen, to that part of our subject which is the necessary corollary to the foregoing facts and conclusions, namely, the *methods which both science and experience* teach ought to be taken towards the end of preventing these diseases.

What then are we taught by the above facts? We first recognize that these bacteria are in many ways related to *fungi* which we find growing on jams, in decaying vegetables, etc., and hence require much the same conditions to be present for their development. We have seen that their constituent elements are those of protoplasm or bioplasm, and that they require C. H. O. N. and S. for their growth and development. But that different bacteria require certain special elementary constituents and certain conditions to be present in order to their favorable development, has been proved not only by what experience has taught us from the history of outbreaks of epidemic diseases, when sometimes small-pox, sometimes measles, scarlatina, etc., has seemed to develop, while the others of the class have for the time being remained in abeyance, but also from the methods of cultivation necessary for the free development of different bacteria. All are aware that we have a numerous series of organic compounds, beginning with the Hydrocarbons consisting wholly of carbon and hydrogen, that we have the Alcohols corresponding to each Hydrocarbon, made up by the addition of oxygen, and that from these again we have corresponding acids formed by the further addition of oxygen. These compounds exist very largely in the vegetable kingdom as starches, sugars, oils, fats, etc.

But besides these non-nitrogenous substances we have the corresponding nitrogen compounds called *amines* and *amides*, formed largely by the addition of the ammonia base to the former compounds, while we have further compounds of these radicals formed by the addition of phosphorus, sulphur, etc. Indeed, it is from the fact that the constituent elements of these *vitalized particles*, as Bastian calls these bacteria, are so similar to many of the above organic compounds that the theory of spontaneous development has arisen, since, as he says, no differences in chemical constitution can be made out between the non-living and the living particles of protoplasm, the latter of which he believes to be "but the temporary and initial developmental form of many organisms which may afterward present distinct characters of their own, though many of the particles may through default of the necessary conditions never actually develop into higher modes of being. But a large number of them undoubtedly give rise to the bodies known as bacteria by a process of growth and development." From these preceding remarks concerning the constitution of bacteria it must be evident that they are abundant or scarce, vigorous or weak, as were Pasteur's cultivated *microbes* of chicken cholera, by having lived in a solution of chicken broth for a length of time during which they had exhausted the nutriment contained in it, and then sunk to the bottom of the solution and there become motionless and inactive. That, then, the proper kind and an abundance of food are essential to the growth of bacteria is not only proved by *culture* experiments, but is also wholly in keeping with the facts of vegetable life in general. As Bastian further

remarks, "their size seems to differ according to the degree of putrescibility of the solution, the amount of heat to which it has been subjected and other circumstances."

If then, we desire to remove the means by which the bacteria of epidemic diseases are to multiply, it is perfectly clear that we must remove or destroy the food upon which they feed and, if possible, every other condition favouring their development.

Such food is found present in earth, air and water. For instance: the superficial portion of the soil itself generally contains organic matter, and its influence on the development of germs is seen when the virgin soil of the prairie, exposed by the pioneer's plough to the sun's rays and to the air, decomposes and favours the development of malaria germs. Air, in many cases, contains what Tyndall calls "the dust of disease"; while many waters, as those of dry marshes, and such as contain sewage deposits, are loaded with organic materials upon which bacteria feed.

But knowing what ought to be done is quite a different thing from the practical performance of what, in a domestic, social, and municipal point of view, is found to have so many difficulties surrounding it. Let us, then, investigate the question of what has been, and is being, done in spite of great difficulties: And first, we shall consider *the solid organic materials*, since, if these can be removed, we have really removed what renders both air and water impure. The organic materials which, as producers of disease, directly or indirectly, claim our earnest attention are what may be summed up in the word *filth*.

Dr. John Simon, Medical Officer of the Privy Council and Local Government Board, gives, in the following words, the chief forms in which filth is likely to exist around us: "There are houses, there are groups of houses, there are whole villages, there are considerable sections of towns, there are even entire and not small towns, where general slovenliness in everything which relates to the removal of refuse matter—slovenliness, which in many cases, amounts to utter bestiality of neglect, is the local habit; where, within, or just outside each house, or in spaces common to many houses, lies, for an indefinite time, undergoing fetid decomposition, more or less of the putrescible refuse which house-life and some sorts of trade-life produce; excrement of man and brute, and garbage of all sorts, and ponded slop-waters, sometimes lying bare on the common surface, sometimes unintentionally stored out of sight and recollection in drains or sewers which cannot carry them away, sometimes held in receptacles specially provided to favour accumulation as privy-pits and other cesspools for excrement and slop-water and so-called dust-bins, receiving kitchen refuse and other filth."

Here, ladies and gentlemen, we surely have Pelion piled on Ossa, and Ossa on Olympus. We have in one long, packed and re-packed sentence, metaphorically reeking and odorous, a description of the filth, from the existence and putrescence of which are "given off not only sickening, dangerous and malodorous gases, but in which also are developed those microbes or bacteria" which are the cause of the great portion of the 125,000 deaths (not to speak of numberless cases of sickness) due, as stated in the Registrar General's Report, to diseases which, from a sanitary standpoint, are, as Simon says, preventible.

But, should the experience of any person present have not already assured, let a few statistics convince, him of the terrible mortality annually due to filth.

In England there were in 1872..................	825,907 births = 6
" " " of children under one year	123,396 deaths = 1

Further, 41% of the annual death rate is of children under five years; while in some towns, as Leicester, the mortality has reached as high as four deaths out of every ten born.

I find that the death-rate amongst

52,883 children in town foundling hospitals under five years was..	72.2%
122,110 " country " " " ..	11.5%

and that 74% of the mortality in London in 1875 for July, August, September was of children under one year, from Diarrhœa.

And, finally, in Ontario in 1881, according to returns, the death-rate amongst children under one year as compared with births, in the ten cities amounted to exactly 25%.

In towns .... $16\frac{1}{10}$%
In rest of Province .... $10\frac{4}{10}$%

while there were

Of children under one year	31.8%	of all deaths in	ten cities.
" "	23.7%	"	towns.
" "	20.4%	"	rest of Province.

Assuming that the death-rate here is due, as we have seen in England, to the great majority of cases of Diarrhœa, as, indeed they are, since we have deaths returned to the Registrar's office under the various names of Anæmia, Atrophy, Infantile Debility, Tabes Mesenterica, Marasmus, Diarrhœa, Dysentery, Lienterie, etc., with most, if not every one, of which Diarrhœa, more or less chronic, has been present, which not only experience, but pathology and biology, regard as peculiarly a *filth* disease, depending, if on no specific bacterium, at least upon the septic ferment, the undesirable and fatal attribute of filth of every kind. This filth is upon and in food, in air, in milk, and in water. It is borne to us by the many avenues, which uncleanliness and slovenliness supply, in bringing our food to us: in milk from dirty cow-byres, dirty milk-cans, and unhealthy stables; in water from wells made impure from the sewage of privies, or from water supplies contaminated with the sewage of towns and cities. But further, by the almost entire absence of any systematic or regular ventilation of houses, the air within becomes not more a means of death by its imperfectly supplying abundance of oxygen, than by the presence in it of innumerable particles of the dust of disease.

What is to be done with this *filth*, is becoming more and more a living, indeed a burning, question not only with sanitarians, but with city and town councils, as well as with every intelligent and respectable private individual. England has some 1,500 Local Boards of Health, more or less actively engaged in the solution of the question; and these have succeeded, in spite of the over-crowding, wretchedness, and poverty, in reducing the annual death-rate to twenty in the 1,000. New York State, with its 947 townships, has laws providing for the constant maintenance of an active Health Board in each, while all of its many cities have boards in each. Ontario has a Health Act providing for the organization of similar boards in each of her 640 municipalities; but the words "*may establish*," of the Act, are too significant of the apathy which exists in many municipalities in this regard, since returns for last year give most unsatisfactory results, as far as the activity of these boards is concerned. The work that such boards are empowered to perform under the Act is certainly most extensive, as seen in the R. S O. (cap. 154) Municipal Act.

Whatever may be the case as regards cleanliness in the individual, experience has proven that wherever individuals have congregated to any extent for residence, cleanliness, indispensable for healthy life, can only be secured by the systematic and united efforts of the public, by the active carrying out of municipal acts, such as are embodied in those just quoted.

Before however, referring to some of the means or machinery for such work, I shall in a word refer to the organic matter, which we have already seen finds its way by so many avenues *into the air*.

None can be oblivious to the fact of the effects of decomposing filth in creating offensive and unwholesome odours, which are borne upon the air; nor can it be doubted that as Simon has remarked, "In filthy urban districts, where the foul air, comparatively incarcerated in courts and alleys, and narrow streets, can act with most force in regard to masses of population, the population always shows an increased mortality under several titles of diseases." How much of such increased mortality is due not only to the absence of abundant oxygen, but to the presence of the germs of disease in abnormal amounts must appear evident from what we have already so amply illustrated concerning the circumstances most favourable for the development of bacteria. Nor does it require discussion in order for us to see that in rooms poorly ventilated the organic particles and vapours exhaled from the lungs of the inmates, the scales of epithelium from their bodies, and the

filth accumulated as dust, must supply most favourable conditions for the lessening of vitality as well as for the development of the bacteria of any contagious disease, which may be either thrown off from the body of some infected inmate or introduced into such an atmosphere from without. Hence the double advantage of increasing the vitality through an abundant supply of oxygen, and through the distribution of any such germs over a larger volume of air, thus aiding their destruction, must be at once evident to all.

We have already said that water becomes another source, through which the bacteria of disease are supplied with means for carrying on their deadly work. The fact of the dangers from this source is well set forth in the following remark: "That filth does not only infect where it stands but can transmit its infective power by certain appropriate channels of conveyance, is seen where houses which have unguarded drainage communication with cesspools or sewers may receive through such communication, the same filth infections, as if excrement stood rotting within their walls; and that public or private water-reservoirs or water-conduits giving accidental admission to filth will carry its infection (Bacteria) whithersoever their outflow reaches." Simon further says: "That where an epidemic of enteric fever, or of cholera, or diarrhœa has been traced (as it generally can be) to some gross excremental pollution of air or water, the primary source of such pollution will generally be found under one of the following heads:—(1) Faults of public sewerage; (2) faults of indoor water-closets, and apparatus for house-drainage; (3) faults of bog-privies.

Hence all will perceive that the excreta of sewers, and water-closets and drains, whether when contained in these, or when passed into wells or public water supplies, create all the conditions most favourable for the development of the bacteria of contagious diseases. There are several reasons why these sources become specially favourable localities for the development of *microbes*. We have then, as already seen, the materials present upon which these animals feed. Not only this, but we also have them less exposed to the oxygen of the air, whose action, on the whole, tends to render them more rapidly innocuous. Again, we have that equable temperature of from 60° to 80° kept up, in which the bacteria of every zymotic disease multiply very rapidly. (See temperature for various diseases, p. 162, First Annual Report.)

I have dwelt, ladies and gentlemen, on the conditions by which zymotic diseases are most readily and most commonly developed, to perhaps a greater length than I should have done, were it not for the fact that other lecturers in this course have discussed the methods of sewerage and ventilation, which, under various forms, are the great means to be employed in preventing zymotic diseases; and, because I conceive that one of the greatest obstacles to sanitary progress is the very imperfect appreciation which the general public have of the real nature of, and the methods by which preventible diseases originate. Before passing on to speak of the results of preventive methods, allow me to enumerate the various ways which have been, and may be adopted, as sanitary precautions.

Beginning with the individual, we mention:

Individual.—1. Personal cleanliness. 2. Cleanliness of clothes.

Household.—3. Cleanliness of the house; preventing the accumulation of organic materials in any form, either in cellar or kitchen. 4. Ventilation: by supplying vitalizing air, and means for the destruction, by oxidation, of organic accumulation in the house. 5. Preventing the accumulation of the gases of perfect or imperfect combustion from stoves, lamps, etc.

Private Grounds.—6. Filth in yards, and, especially, the removal of every means by which organic materials may be carried into well-water, if it be used.

Public Sanitation.—7. The removal of excreta by the water-carriage system, and the adoption of all the precautions necessary when such a system is adopted. 8. In parts of towns, where such a system is not adopted, there should be the universal adoption of some of the following systems: *(a)* The midden system. *(b)* The pail system. *(c)* The earth system. *(d)* The charcoal system.

Without detailing a description of these I may mention that, properly carried out, the best forms of them mean the removal of excreta, and house refuse daily, weekly, or less frequently, according to circumstances, before it has had time to accumulate, and by

putrefaction to become the *nidus* or the development of already present bacteria—or such as may be wafted to it—this putrefaction being prevented by the addition of ashes, earthmold, charcoal, or disinfectants. All will have heard of the Rochdale *pail* system in which the systematic removal of excrement is carried on with almost no expense to a city of 70,000, in which this system is supplied to 36,894 of the population. Had I time a description of it must prove most interesting.

I may state, however, that from a calculation based on a weekly balance sheet, we see that the total cost of the removal of excreta and house-refuse for a population of 36,894 was at the rate of £14 6*s.* 8*d.* per 1,000 of population per annum, or $69.66.

The importance of preventing the sewage discharge contaminating the water supply is very great, since in Ontario we have everywhere too many examples of the almost total neglect of this most reasonable precaution. Further, the discussion of the very extensive and most important question of the prevalence of *malaria* in its many forms, and with its many results, must be deferred.

The last part of this division of our subject must refer to the prevention of the spread of disease when actually present. It divides itself into three parts, the first being

(*a*) The *removal of the exciting causes* or the nutriment on which the germs of contagious diseases are developed. These have been indicated in the various remarks concerning the disposal of filth everywhere present in its protean forms.

(*b*) The second part is the *isolation of the infected* patient, and so dealing with him that he shall neither carry the bacteria of disease to others, nor shall any other person, thing or atmosphere bear the exuvia or excreta from him to others of the community who may be unprotected against the disease.

There are in connection with this question many and often very serious difficulties to be met with and overcome; some in the peculiar nature of these diseases; some in the ignorance of the public of the peculiar qualities of the contagiousness of these diseases; some in the selfishness, parsimony, and utter disregard for the safety of others sometimes exhibited by the members of families in which there may be sickness; and many in the poverty, which prevents there being room enough for isolation in many houses, and for the supplying of the various measures for the regular adoption of disinfectant precautions.

With reference to the first of these difficulties which is indeed a serious one, we have the fact that with some of the infectious diseases the exhalations from the breath of the patient, as in measles for instance, bear the germs of infection into the air, where they may be inhaled by others, and this for one or more days before the eruption and other distinctive characters of the disease are developed. Similarly we find that even with diseases so serious in their nature as diphtheria, we have the unprotected often exposed to the exhalations from the sick ere the nature of the disease has been diagnosed, and methods of isolation and disinfection adopted. In both cases there are two or three primary indications that none, either lay or medical, can afford to neglect:

1. Whenever any contagious disease has in any degree been prevalent, it ought to be the immediate duty of the parents to notify the family physician whenever any child shows feverishness or other suspicious circumstances.

2. The medical man whenever contagious disease has been diagnosed or is suspected, ought immediately to isolate the patient. Without making any insinuations whatever, it must be confessed that for various reasons the physician has hitherto in many cases neglected to urge upon the family the absolute necessity for this simple precaution, or if taken, his instructions have not been followed out to their fullest extent.

3. The third indication is that, should it be that the child of one family has become inoculated ere isolation has been adopted, the task of confining the disease within a single house can be in most cases easily and completely carried out.

4. Isolation having been thoroughly effected, disinfection through the adoption of means for the destruction of the emanations from the breath, the exuviæ from the body, and the dejections from the bowels should at once be performed.

Concerning the destruction of these germs, we have one primary method of universal applicability, by which the introduction of fresh air by ventilation does in a large measure serve to oxidize or destroy germs, and introduces fresh oxygen for the general health of the patient.

But many other more specific methods should be instituted, amongst which those collected in a pamphlet printed by the Provincial Board of Health last year, cover most of the points necessary to be attended to (*vide* the Annual Report, p. 68.)

The point included in *Rule 2*, is one which will serve as introduction to the discussion of what is fast becoming the most important sanitary question which we have to deal with, since only by such means as this can local authorities be enabled to detect the centres of infection, and so be enabled to adopt measures either through the physician and family, or their inspectors to discover and remove the immediate cause, and have disinfectant and isolation precautions taken.

As a part of such a scheme, there are, however, a number of things necessary, and amongst these we have—

1. The establishment of an active Local Board.
2. The appointment of an executive Medical Officer.
3. The hearty co-operation of the people in the work of repressing disease, since if this be not present, the notification of disease must ever be imperfect, and the health officer will not be able to control all the avenues by which infection is spread.
4. Isolation Hospitals or Sanitoria, where such persons as through poverty or other circumstances are not in a position to be isolated in their homes, may receive such attention as will best aid their recovery, and the safety of the general community.

These desiderata being supplied we may fairly expect that certain tangible results will follow, if the *bacterium* theory has in it any degree of truth.

It now becomes our pleasing duty to indicate very briefly some of the results which have flowed from the methods which have been adopted towards the prevention of zymotic diseases.

Taking some of the more important of these methods in order, let us first refer to the *removal of excreta* and filth.

It will be found difficult to accurately calculate the number of deaths from the absence of, or the number of lives saved by the adoption of any single precaution inasmuch as various sanitary improvements commonly are carried out side by side.

Let us illustrate the point by one or two examples: In London, there is a class of dwellings called The Improved Citizens' Dwellings, now accommodating 11,000 families. In many of the districts occupied by these houses, the death-rate in the wretched houses formerly existing there amounted to from 35 to 50 per 1,000. Of the 50,000 persons inhabiting those houses there has been a saving of about 1,000 lives annually, and a reduction in the number of cases of illness of some 15,000 to 20,000 per annum—the death-rate in these dwellings being now not more than 14 to 16 per 1,000. Rochdale, which before the introduction of its so-called *pail-closet* system for the removal of excreta had a death-rate of over 30 per 1,000, now has a mortality of not more than 20 per 1,000. There can, however, be no necessity for multiplying examples. So much, then, for the lessening of filth largely in the solid condition.

Taking a case or two illustrative of the lessening of mortality from ventilation and the supply of good air, it may be stated that while in the borough of Newcastle-on-Tyne the mean duration of life is only 29.4 years, it increases in the rural district of Northumberland to 42.3.

Passing on to the effects of the disposal of sewage by a well-organized water-carriage system, Dr. Pettenkofer states that, in Dantzig, between

1865 to 1869, with no sewerage nor proper water supply, from Typhoid Fever, there were	108	deaths	in 100,000
1871 to 1875, with introduction of water supply ..	90	"	"
1876 to 1880, with sewerage system, as	18	"	"

Dr. Chadwick states that, in Hamburg, between 1872 and 1874, mortality from Enteric Fever was:

In unsewered districts.....................	40	per 1,000	of all deaths.
In partially-sewered districts................	32	"	"
In fully-sewered districts	26.8	"	"

Referring to the question of isolation and its effects upon the death-rate, we have

less numerous but yet abundant evidence of its invaluable aid in the stamping out, or at least the lessening, of contagious diseases.

From the Annual Report of the Local Government Board of Great Britain for 1880–81, upon the influence of hospitals for infectious diseases, I take a few extracts, thus:

"Before the erection of the Delancey Hospital at Cheltenham, small-pox had, on numerous occasions, been somewhat widely spread in the town. In 1838, it caused 52 deaths; 12 in 1861, and 32 in 1865. During the six years, however, which, at the time of writing, had elapsed since the providing of adequate means of isolation for the disease, small-pox broke out on twelve different occasions. All the imported cases were at once removed to the hospital, and in no single instance had the disease spread beyond the house where it first broke out."

At Warrington fifty-two cases of scarlet fever had within a few months been removed from forty-four houses in which were as many as 101 not protected by a previous attack of the disease, and yet in only one house did a subsequent case occur. Such are some of the results of the isolation of persons attacked by two of the most virulent, fatal, and at the same time infectious diseases.

Referring to the law for "The Compulsory Registration of Infectious Diseases," as many here are aware, the discussion of the question of calling upon the citizens of any community to notify the health authorities of the outbreak in their families of any of the so-called infectious diseases has been warmly discussed, not only in the United States, in different cities, but likewise in England, where such a bill has recently been introduced into Parliament. It has always appeared a mysterious thing to me how people who have been unfortunate enough to have members of their families attacked by some serious infectious disease should desire to hide the fact from the public, as if it were something they had cause to be ashamed of—taking in fact every means to convey the same amongst their most intimate friends by their one-sided reasoning. Surely the natural course of reasoning would be that instead of this, they would be only too happy to adopt every means by which neighbours would be preserved from the danger to which they unfortunately have become exposed. However, such ideas do prevail, and seem further to have impressed themselves in some degree upon members here and there of the medical profession. The arguments used by these are that the notification of a Health Officer by them would be a breach of professional confidence; that by such means they would become spies and informers, and that people knowing this would not summon medical aid, and so the evil would only be increased. Without discussing any of these points, it is quite a sufficient answer to refer disputants to the statistics already quoted, and to many others equally decisive. Wider views of many matters of a medical character in their relations to the public and to municipal and state interests are in many cases very much needed; but none watching the course of events can fail to notice that in these matters very decided changes are taking place in the public mind. Newspapers, public meetings, municipal legislation, are all influencing social sentiment to the extent of causing people to know that while human life has its foes, and pale Death his manifold instruments, still life's bulwarks may be rendered more impregnable, and the forces of Death weakened and made impotent by the intelligent, persevering, and unremittent exercise of human effort. But how few indeed can be made to comprehend in its entirety what this means! The pathway of human life, as marked out and limited by a divine Intelligence, is through no asphodel meadow, though mythic elysiums have been sung and hesperidean gardens pictured. True, indeed, it is that the human heart, with

"Trouble on trouble, pain on pain,"

turns longing, Ulysses-like, toward the pleasant shores of some lotus-land, wishing there to rest,

"Propt on beds of amaranth and moly;"

but such, indeed, shall never be, except through labour and perseverance. Though golden threads of divine love run through the woof of human events, yet it is the dark ground which, in large degree, makes up the web; and as man himself in so large measure determines

its character, it shall only be by never-ceasing labour that its perfect making shall be accomplished. Nature's laws are immutable, and a severe justice declares that physical, as well as moral causes, shall have their definite effects. This being the case, how imperative it is on all to patiently strive to determine in some degree what foes, seen or unseen, we have around us, and to steadily work toward the end of lessening their number and weakening their power. The knowledge of the laws of bacterial life, the extent and potency of the influence of these beings upon more highly organized nature, the part they play in changing substances into what is injurious to health, and the methods by which their development and action may be restricted or prevented, are of an importance every day more evident to the non-scientific, as well as scientific members of the body politic. In concluding, therefore, I appeal to all present to make more general the knowledge they may have gained of the nature and power of these microscopic organisms, and to urge in every direction such sanitary measures as experience has shewn, and is demonstrating, to prevent the fatal effects upon human life of these minutest in size and lowest in the scale of all organized life.

Sanitary Conditions which Cause Malignant Epidemics.

(By H. P. Yeomans, B.A., M.D.)

In connection with the subject under consideration I propose to refer to two general principles which may be stated as a result of the experience and observations of competent authorities.

1. That there is in the human system a natural and inherent power enabling it to resist the destructive force of infective or contagious diseases.

2. That this resisting or cleansing power is greater when pure air, proper food and general sanitary conditions of living are such as to promote physical vigour.

Now, in considering these two points, we may notice first the life of the blood, as it has been demonstrated to us by physiologists, bearing in mind that the principles and laws of life of the various tissues and organs in the body are similar in many respects; and in approaching this part of our subject we may allude to the labours of one who merits the honour of having placed the study of human physiology on a sound basis. I refer to the researches of Mr. Harvey.

There are periods in the history of national development, in the history of the advancement of the different departments of science, and in the development of the various branches of industrial pursuits, when the discovery of a new principle or truth projects all the energies of investigation or labour in new and more direct paths; when a new impetus is given, a broader and a brighter field is opened up for cultivation, and an opportunity is afforded for the achievement of greater conquests.

In the seventeenth century such a period occurred in the history of the science of medicine and the pathology of disease, when the illustrious Wm. Harvey, Professor of Anatomy and Surgery at the Royal College of Surgeons, England, announced his discovery of *the circulation of the blood.*

We may form some conception of the spirit of the age in which Harvey's discovery was announced, and of the manner in which it would be received, by quoting his own words expressed at that time :—

"When I began," he said, "to study, not in books, but in nature and by the help of vivisections, the movements of the heart, the task appeared to me so difficult that I was almost tempted to believe that God alone could understand them. But by giving each day more attention and care in multiplying my vivisections, making use of a greater variety of animals, and collecting many observations, I believed that I had at length arrived at a knowledge of the truth. Since then I have not hesitated to communicate my views not only to a few friends but in public in my anatomical teachings. They have been favourably received by some, blamed by others. On the one hand, the crime has been imputed to me of straying from the precepts of my predecessors; on the other hand, a desire has been expressed to see me further develope these *novelties,* which might

perhaps be worthy of attention. At length, yielding to the counsels of my friends, I decided in making use of the press in order to submit myself and my labours to public opinion."

This discovery having withstood many years of adverse criticism at last triumphed over all obstacles and became a physiological fact, universally accepted.

Then followed the investigations in microscopical physiology and pathology, which have awakened so much interest, especially during the past few years. Specialists have revealed new and marvellous truths, and are now constantly unfolding scientific facts of immense importance as to the relations existing between matter and life.

We see an illustration of these relations in the life of the blood. The microscope demonstrates to us that there are in the blood living organisms endowed with an inherent vital power which enables them to perform functions of nutrition and to promote the growth, development and sustenance of the body, and also to protect the body against the inroads of aggressive disease.

Moving along in the circulating current of the blood, as it flows in the arteries, may be seen by the aid of a microscope the blood corpuscles, small globular or disc-like bodies $\frac{1}{3200}$ of an inch in diameter. Some are in their earlier stages of development, others have arrived at maturity and are performing all the functions of corpuscular life. These individual organisms, though very minute, have very important work to do. They receive oxygen and nutrient material supplied in the process of nutrition and carry it to the various tissues and organs of the body, where it is, by certain vital processes, assimilated and appropriated as required. Contained within the corpuscle is a thick viscid gelatinous fluid. This fluid has bioplastic powers. It has the power of converting inorganic into organic matter, inorganic into living matter, living into formed matter. All nutrient material furnished to it is immediately transformed and prepared for appropriation to the various tissues of the body.

Here we have a vital endowment possessed by this vital organism of the blood which is similar to the vital endowment possessed by bioplasm in the organic life of animals and plants for the purpose of their nutrition. In the human body we have bioplasm not enveloped in a cell-wall, just as we have in organic life of other animals and of plants.

It has been observed that some of these corpuscles are in the earlier stages of their development. Now, although their source is at present a question of discussion, sufficient has been observed to show that they are formed, live a certain time, and disappear after having fulfilled their functions in life. They are constantly being replaced, according to the estimate made by a recent German authority, at the rate of one hundred and seventy-five millions per minute.

This principle of life and vital endowment applies with equal force to each elementary organism of the human body, and is thus stated by the great physiologist, Dr. Carpenter :—

"Each elementary part of the fabric has its own independent power of growth and development, its own proper term of existence, goes through its own sequence of vital actions in virtue of the vital endowment which it derived from the tissue that evolved it, and of the influences to which it is subjected during the progress of its existence. In accordance with this vital endowment or principle when the body is in perfect health the process of growth, development and ordinary nutrition proceed uninterruptedly with constant precision. But when accident or disease interferes with the healthy physiological action of any of the organs the blood is called upon to exercise an entirely new function. In order to illustrate this, we may select the instance of a case which has been used by Prof. Lister, the greatest living advocate of antiseptic surgery, proving the power of purified blood to resist putrefactive changes.

"Suppose a man meets with an accident which breaks his ribs, and that as a consequence blood escapes into the pleural cavity, that is into the space between the lungs and the ribs. Suppose air gets in in one of two ways. On the one hand, the injury which broke the rib may have inflicted a wound on the soft parts *covering* the ribs so that air communicates directly through the chest wall with the effused blood in the pleural cavity. What will be the result? The experience of the surgeon, whether he believes in the germ theory of disease or not, is that the effused blood will undergo putrefaction, with all its attendant dangers.

"Now, on the other hand, suppose the *chest wall* has *not* been *punctured* at all, but that the sharp end of the broken rib has injured the lung so that at every breath *air* is pumped into the pleural cavity from the *lung* and mixes with the effused blood; will the blood, under these circumstances, decompose? It will not. It will remain pure, and in all probability be absorbed. 'This was to me a complete mystery,' says Prof. Lester, 'until I heard of the germ theory of putrefaction, when it occurred to me that air should be filtered of germs by the air passages, one of whose offices is to arrest particles of dust and prevent them from entering the air cells.'

"The human system, by virtue of its vital endowments, has not only the power to carry on the ordinary functions of nutrition, but also in unnatural conditions and unhealthful surroundings it possesses the power to resist the inroads of disease and to protect itself against destructive agencies."

On page 38 of our first Annual Report, Dr. Covernton alludes to a remark made by the celebrated Pasteur before the members of the International Sanitary Congress at Geneva, which shows this colytic or cleansing power as exemplified in the oxygen of the blood. Pasteur has experimented on microbes, the specific germs of the virus of hydrophobia, and with regard to these he says that microbes cultivated unexposed to oxygen become more and more virulent, whilst those exposed to oxygen become progressively attenuated. Dr. Van Buren, of New York, also in his article on "Causes of Inflammation," in International Surgery, alludes to the observation of Pasteur regarding the germs of "the vibrio septica"—one of the most active and dangerous of bacteria, which is singularly *indestructible by extremes of heat and cold*, and by the most powerful chemical agents. That the organisms into which they develope are *not* tenacious of life when *exposed* to the influence of free oxygen, but wherever oxygen has no access they germinate with inconceivable rapidity—he observes the existence of this peculiarity in other members of the family. These organisms after having used up all oxidized material cease to act showing that *thoroughly oxygenated blood* has the power of destroying disease germs.

Similar experiments conducted by the great German Pathologist Virchow and others, have yielded the same result.

We have, *in the body*, living organisms which are the source of life and health, and we have also on the other hand, *all around us*, specific germs of disease, living organisms, which are prone to destroy life. There are thus *two antagonistic forces* constantly operating in connection with human life, and in the course of the investigations of these two antagonistic living organisms, two sorts of experiments are being continually carried on.

The Scientific and the Popular.

The scientific are those carefully pre-arranged experiments which are performed in our laboratories on animal fluids and on lower animals. The popular are the large number of crude experiments which are carried on in the course of wide-spread epidemics and under unfavourable or unhealthy social conditions. These are the result of negligence or ignorance, but we have the results given us for our interpretation.

In the one case we reason from cause to effect, and in the other from effect to cause. A comparison of these two methods is constantly being made and certain practical results obtained. Upon this ground-work the science of preventive medicine during the past twenty-five years is being built up.

In the *laboratory*, experiments have been made on *animal fluids* which prove that living organisms find their way from outside *into these fluids*, and then multiply indefinitely causing putrefactive changes. For instance, an infusion of beef placed in a vessel exposed to the air in a few days undergoes certain changes. It has, at first, been quite clear and odourless, it soon becomes cloudy and muddy; a film forms over the top of it. Take a little of cloudy fluid and place it under the microscope; we find it *swarming* with *living organisms* which move about in the field of the microscope; we see them *multiplying*, giving rise to similar bodies. They are always present in decomposing fluids exposed to the air, while, if the fluid be protected, it will remain clear and odourless for any length of time.

A beautiful experiment by Prof. Tyndall, illustrates the constant presence of living organisms in the air. "He gets a large square box with a glass front—the back and

sides, top and bottom are wooden—two small glass windows are situated, one at each side, facing each other. Through these windows he allows a condensed electric beam to pass; the inside of the box is smeared with glycerine; test tubes are fitted air-tight into holes in the bottom of the box, their open ends being within the bottom of the box; a pipette passes through the top, by means of which fluids can be introduced, when required into the test tubes. The door of the box being closed, the electric light is so arranged that the condensed beam passing in at one of the side windows emerges at the window opposite. If you look in through the glass front, its track is seen to be eminently brilliant and the dust in the air of the box is at once brought to view. Now, this box is allowed to remain at perfect rest three days; if it be examined during the interval, the beam inside the box will be seen to have *faded in* intensity. On the third day within the box it has *completely disappeared*, whilst outside the box it is as bright as ever. The floating particles which were rendered visible by the beam of light, and which in their turn rendered the light visible had vanished; they had subsided and adhered to the glycerine; the air inside the box was optically pure."

"Now suppose we introduce into our test tubes some infusion of beef or any other organic fluid, this from contact with the air outside the box is contaminated with the dust of the air. Heat will destroy these motes. To purify it then, the fluid contained in these test tubes is boiled by means of an oil bath. Now we have the test tubes whose open mouths are exposed to the *air inside the box.* This air, *the electric beam tells us, is free* from dust. The test tubes contain an organic fluid which has been boiled so as to *destroy* all motes which could have made their way into this fluid. The beef infusion will, under these circumstances, remain clear and pure for months, whilst the *same fluid in test tubes exposed to the ordinary air* will become foul in a *few days.*"

We thus see in our laboratories that dead animal tissues, when exposed to ordinary air or ordinary water, invariably breed septic organisms, in other words, contact of septic germs with *dead tissues or with impaired forms* of living tissues *never fails* to produce successful inoculation. But it is quite otherwise with the *same tissue* when *alive*, and forming part of our bodies you cannot always successfully innoculate the living tissue with septic bacteria. It has been proved over and over again that these organisms when separated from the decomposing medium in which they grow, can be injected in quantity into the blood of a healthy animal, or applied to a sore on its skin without producing the least effect. *The healthy living tissues are* unsuitable soil for them.

It seems also probable that septic organisms enter constantly into our bodies with the air we breathe, and the food we take, since they are always present in the air; they pass presumably like any other minute particles through the open mouths of the lymphatics and lacteals, and penetrate some distance into these channels, they certainly come in contact with accidental cuts, sores and scratches, which so often bedeck our skin, notwithstanding all this, our bodies do not decompose, indeed if ordinary septic organisms could breed in the living tissue, our bodies would infallibly perish.

Dr. Sanderson, Prof. of Physiology in the University College, London, has performed a series of well conducted experiments in order to illustrate the effects of specific germs on the living tissues, he draws the following inferences as a result of his investigations:

1. Ordinary bacteria are in themselves innocuous when introduced into a *healthy organism*, probably because of a *colytic or cleansing action* of the blood and tissues.

2. When bacteria are provided with fluids, either in or out of the system, which have lost their colytic or cleansing action, they (as the yeast plant in the presence of grape-sugar sets up vinous fermentation) by their growth and development set up fermentative changes, the result of which is the production of a virus, which, when it finds its way in the blood-stream, causes septicæmia.

Dr. George Harley, of London, performed the following experiment on a terrier dog at the Zoological Gardens:

He took a quantity of microscopic green fungi in full bloom from the scum on the surface of water in a dish containing the putrefying remains of a cobra (an animal that killed his keeper). An ounce of this saturated water was injected into the jugular vein of the dog; in forty-four hours it was dead. *Before the injection was made*, some healthy blood from the living circulation had been withdrawn and impregnated with fungi and

sporules. After the death of the animal blood was also withdrawn (that is blood impregnated after death). There were thus two specimens of blood—one impregnated after death, and one impregnated before death. In the former specimen of blood, abundance of fungus-filaments were found, while only a few were present in the latter.

This experiment clearly indicates the power of blood in the living circulation to resist the development of specific disease germs.

In the spread of contagious or infectious diseases during an epidemic the specific germs of the disease (first) enter the blood of the individual attacked, and there begin to exercise a destructive agency.

Prof. H. C. Wood, associated with Dr. Howard, at the suggestion of the United States National Board of Health, have lately made some researches as to the nature of the contagion of diphtheria, which will shortly appear. Studies made upon the blood in these experiments and in the cases of malignant diphtheria showed that the micrococci first attacked the blood corpuscles, in which they move with a vibrating motion. Under their influence the corpuscles lose their healthy appearance, and finally become full of microcci, which are now quiescent, and increase until the corpuscle bursts and the contents escape as an irregular transparent mass full of micrococci. The blood, during life and after death, contained micrococci , these were found also in the internal organs in abundance.

From their culture experiments they concluded that the only detectable difference between the micrococci found in ordinary sore throat and diphtheria is in their reproductive activity, the former ceasing their reproductive activity at the *third* transplation, while the latter grew rapidly up to the *tenth* generation : they are therefore the same organisms in different states. The malignancy is therefore in direct proportion to their reproductive activity. Their reproductive activity is also in direct proportion to the suitableness of the soil. Blood rendered impure, or having lost its full complement of vital power, will yield most readily to the destructive agency of these specific disease germs ; while, on the other hand, thoroughly oxygenated blood, possessing in full vigour all the inherent vital power of health can not only resist the agressive action of these germs, but can destroy them, and finally eliminate them from the system.

Similar experiments have been made to prove the presence of the baccillus, the specific germ causing malarial fever. The rods and spores have been found in the blood of patients suffering from the fever. One observer states that he saw the baccilli, within five minutes from the time when the cold stage manifested itself.

In fifteen patients affected with typhoid fever, examinations were made of the blood taken from the general circulation and from the spleen by means of a hypodermic syringe, with the following results:

" At the heighth of the disease micro-organisms, both isolated and grouped, spherical rod-shaped bodies analagous to micrococci of diphtheria, were observed in great numbers in the blood. During convalescence these micro-organisms lessened in number, both in the splenic and systemic blood." These organisms have frequently been seen after death in cases of typhoid fever by a great many observers.

It is a matter of common observation that during the progress of an epidemic some persons escape an attack, though constantly moving in an atmosphere loaded with disease germs ; on the other hand, some suffer from mild, and others from severe attacks. This variety in the manner and method of attack is said to be due to different susceptibilities of individuals. Dr. W. B. Richardson, a well-known authority on typhoid fever, holds that we are more susceptible to the actions of poisons of the spreading diseases at those seasons of the year when there is excessive waste of bodily structure, and less susceptible to them in those genial seasons when there is a balance in favour of nutrition, or, in other words, we are more susceptible and less able to resist the invasion of disease when the vital power of the living organisms or organic structures in the body is impaired by unhealthful surroundings or circumstances and conditions of life.

The *Canada Lancet*, Sept., 1880, contained an article describing the appearance of the blood under the microscope in the case of Tanner, who excited the curiosity of the world by his forty days' fast in the city of New York, which, no doubt, you will remember. It was affirmed that "it would be impossible for him to have held out much longer, as the blood

showed under the microscope at the end of the fast evidence of rapid disintegration. The red corpuscles were irregular, shrunken, and presented so-called fungoid growths upon their surface. Within twenty-four hours after food was taken the fungoid spores began to disappear, and in three or four days the blood became normal.

This observation shows that the vital power of the corpuscles, by virtue of which they are able to resist disease, is lessened in cases where insufficient food, or improper food is supplied.

It was stated by Dr. Carpenter, during his visit to Toronto last summer, in an address delivered before the Dominion Medical Association, "That a mild epidemic of any contagious disease may assume the malignant type in case of individuals whose blood or system had been rendered impure by unhealthful surroundings."

A short time before hearing this address there occurred in my practice an illustration of this general principle, and I would like to relate the facts as taken from my notes of the cases at that time.

A family, composed of the parents and six children, lived in a small frame house during an epidemic of scarlet fever. I was called on Sunday afternoon to see one of the children, a little girl of five years of age, who at that time had all the symptoms of malignant scarlet fever. Upon recognizing the gravity of the case, I suggested the propriety of procuring the assistance of another medical practitioner. Notwithstanding our united efforts to save the life of this child, within twenty-four hours after the appearance of the first symptoms, death occurred. Next morning another child, a little girl, died of the same malignant disease; the attack lasted twelve hours.

At this time it was decided to remove the whole family to an adjoining house, which was to be thoroughly cleansed, disinfected, and prepared for their reception. The preparation occupied two days, and during this time a third child, a boy of six years, had been attacked. He was removed while suffering from the disease, all clothing having been left in the vacated house. Within three days from the commencement of the attack he also died, thus *within six days three children had been sacrificed to malignant scarlet fever* of the most virulent type. Another child of fourteen months was now attacked with symptoms of scarlatina anginosa, a milder type of the disease, and recovered—shortly after thie, however, it was found that albuminuria had set in, and from this he subsequently died.

The remaining two children, the oldest, suffered from lighter attacks and ultimately recovered.

No other cases of malignant scarlet fever occurred during the whole course of this epidemic. Every precaution was taken to prevent a spread of this malignant type of the disease.

Now, the conditions and circumstances of this family differed from that of the others in the following particulars:—

They were very poor, and lived in a small frame house, the floor of which was full of cracks, allowing the refuse of the house to fall through and accumulate on the damp ground underneath. The heat of the interior of the house caused a continual evaporation of poisonous material from the ground through the floor into the rooms. Besides this, a quantity of wet saw-dust lay all around the house on the ground. During the preceding summer the parents were accustomed to leave the children alone in the house while they were both away engaged in their daily work. The children thus left to themselves were accustomed to use water for drinking and cooking procured from a swamp near by the house (there being no well). At the same time insufficient and improper food had been used for months before the disease appeared in the family.

In this instance the specific germs of scarlet fever entered the blood, previously rendered impure by the transgression of sanitary laws, and developed malignant scarlet fever in this unfortunate family, who otherwise might have suffered from only a mild type of the disease.

I may mention *en passant* that it has been lately asserted that scarlet fever, diphtheria, and typhoid fever have the same points of resemblance, inasmuch as they all arise where impure drinking-water, infected atmosphere, imperfect sewerage, or other unhealthful conditions exist, and that the origin of these diseases can, in a great majority

of cases, be traced to a source of this kind ; and that, by a careful attention to this source of infection and the water-supply of the house, you can almost certainly banish these diseases from a family.

I have related in detail the circumstances of the foregoing cases as an illustration of the manner in which a malignant disease may suddenly develop from a mild epidemic in a locality where sanitary laws are neglected or violated.

Such cases are *not uncommon*, as experienced physicians well know. Many instances have been recorded, and many more *have occurred* and have *not* been recorded.

There is, however, sufficient evidence at hand to substantiate the principle and enforce the lesson involved.

In conclusion, I would like to speak of the necessity of a universal diffusion of a knowledge of the laws of health.

The thousands of valuable lives annually sacrificed in this Dominion by the unchecked spread of preventable diseases, and the thousands of lives annually sacrificed through self-induced and social causes of disease eloquently call us forth in the interests of our country, and in the interests of common humanity.

Cities have taken the lead in teaching sanitary science in schools, and in enforcing sanitary laws. The result of this is that our Provincial Registrar's returns show a lower rate of mortality from typhoid fever and diphtheria in cities than in small towns and rural districts, although the natural hygienic advantages of the latter are infinitely superior.

The fact that the Public Health Act of 1873 remained inoperative for nearly ten years in a very large number of the municipalities in Ontario is conclusive proof that there exists to-day a most lamentable apathy and indifference to the necessity of sanitary reform. This arises no doubt from ignorance of the laws of health, of the principles of sanitary science, and of the causes or nature of disease.

We have now sufficient sanitary legislation to enable us to save thousands of lives if it were enforced, but in order to make it effective the people must possess an intelligent appreciation of public hygiene.

We are doubtless at present arousing ourselves more than ever to the importance of this great work of disseminating the principles of sanitary science.

By collecting sanitary statistics, recording and preserving the history of epidemic and endemic diseases in our midst, and making physiology and sanitary science a prominent branch of instruction in all our educational institutions, we are endeavouring to promote sanitary reform.

We are placing in the possession of every one knowledge which will teach how, on on the one hand—

1. To avoid those enervating influences which lower vital power and lessen physical vigour—enervating influences which insidiously undermine the source of life, and make us susceptible to the easy invasion of disease.

And, on the other hand, how—

2. To cultivate and practice those habits of living which promote health, intellectual and physical vigour, and protect us against the multitudes of destructive agencies around in the form of infective and contagious diseases.

Article IV.

"SCHOOL HYGIENE."

(A Paper read at the Annual Convention of the Ontario Teachers' Association in Toronto, August, 1883.)

BY WM. OLDRIGHT, M.A., M.D.

There are few subjects of as much importance in their bearing upon the welfare of the people of this Province in the near future as that of "School Hygiene." I am, therefore, glad that it is one of the subjects which you have selected for discussion at this meeting of your Association. I trust that the remarks whlch I have been requested to make will be taken as merely the opening of the discussion, that others will follow me, and that we shall have an earnest consideration of the questions taken up.

I suppose it is hardly necessary for me to prove that as a general rule—not in exceptional cases merely—boys and girls, as well as their teachers, are not improved in health by their school life; in other words, there is plenty of room to struggle after the ideal hygienic conditions in connection therewith. Were it necessary to prove this, I would do so by pointing to either teacher or pupil at the close of school term, and again at the close of vacation;—I need only point: you have seen the contrasting pictures often enough to be able to recall them to your mental vision.

Shall we not, then, enquire whether there are changes which we can help to bring about to improve the conditions of school life, and what they are? And shall we not, one and all, do our part and our best to bring them about? I feel that if any good is to come from a discussion of this subject, it must be by each one of us taking hold of it in this practical way; and I do believe that it will be so taken hold of.

One of the first things, then, that we shall enquire into, is:

The condition of the Air in our Schools.—It is a well-known physiological fact that a healthy adult man exhales six-tenths of a cubic foot of carbonic acid per hour. It has also been proved by experiment that six parts of carbonic acid in 10,000 of air is all that can be breathed with a proper regard for health: *i.e.*, two parts in 10,000 in excess of the amount naturally contained in the atmosphere.

A very simple calculation, then, tells us that to keep the air at a healthy standard, 3,000 cubic feet of air must be supplied. It has further been proved that with ordinary appliances for ventilation, and taking into consideration our climate, three times in an hour is about as often as the air in a room can safely be changed. This, then, would require that a room should be so capacious as to give to each individual adult 1,000 cubic feet of absolute space, necessitating in a room 12 feet high a floor space a little over 9 feet square.

But, it may be said, children do not require so much, becouse they are smaller, and there is not so much blood to be oxidized. True, there is not so much blood, but remember that there is more growth and waste in proportion; their blood circulates more rapidly, and their respirations are more frequent; besides, their organizations are more delicate and susceptible to unhealthy influences. Hence, we cannot safely deduct much from the amount of fresh air, and consequently from the air space, required by children.

I am aware that the army regulations only allow to the soldier 600 feet; well, if we are to give our children less than is requisite for the fullest requirements of health, according to the above calculation, let us give them, at any rate, as much as the Government allows to the hardy soldier, and make the very smallest limit not less than 600 cubic feet, or in a room 12 feet high, not less than 7 feet square of floor space.

I now ask you to tell me in the discussion which will follow, in what proportion of our schools we will find air spaces, of 1,000, or even of 600 cubic feet per individual; and to tell me also what is about the average space that is to be found. I hope that we shall get answers to these questions, as the presence here of so many who are able to

answer is an opportunity of which I feel sure the Board with which I am connected would desire to avail itself in its labours in regard to this subject.

Having settled the average amount of air space, the next question to be put is :—Are there appliances for changing the air in it the requisite number of times to give a product of 3,000 feet, or something near that amount ?

If not, what is the result ? It has been found, as the result of actual analyses and experiments, that air containing eight or nine parts in 10,000 of carbonic acid produces nausea, loss of appetite, headache, irritability, and allied symptoms. Are your little scholars ever peevish and fretful ? I must not ask whether children of an older growth ever become so; no wonder if they do. It is hard to get exact statistics of mortality in connection with various degrees of vitiation of air by respiration, as other unhealthy conditions are often associated; but the above results were found to be solely attributable to the vitiation of air by respiration to the extent named. Of course, mortality statistics associated with an indefinite amount of air vitiation are to be had.

If some of the poor little fellows above alluded to as breathing bad air could be aroused to the necessary vigour, I would like to furnish them with the following "pome," to be recited during visits of the powers that—(do not)—provide school accommodation. I take it from a paper read by the Rev. Mr. Fairfield, of Michigan, who has altered it, as he says, "to meet the case" in point. I believe that in its original form it was addressed by a congregation to their sexton, but it is here dedicated to the caretaker of a school :—

"Oh, sextant of the school-house, which sweeps
And dusts, or is supposed to ! and makes fires,
* * * * *
O, sextant ! there are 1 kermoddity
Worth more than gold, which doesn't cost nothink—[?]
Worth more than anythink except the sole of mann :—
I mean pewer are, sextant; I mean pewer are !
O, it is plenty out o' doors, so plenty it doant no
What on airth to do with itself, but flies about
Scatterin' leaves, and blowin' off men's hatts;
In short, it's "jest as free as are" out dores.
But O, sextant, in our school-house it's as scarce as hen teeth—
* * * * * * *
"U shet 100 girls and boys,
Speshaly the latter, up in a tite place—
Sum has bad breths, none ain't 2 swete,
Sum is fevery, sum is scroflous, sum has bad teath, and sum ain't over cleen :
But every 1 of 'em brethes in and out, & out & in,
Say 50 times a minit, or one million & a half breths an our ;
Now how long will a school-house full of are last at that rate,
I ask you ? Say 15 minits, and then what's to be did ?
Why then they must brethe it all over agin,
And then agin, and so on till each has took it down
At least 10 times, and let it up agin. And wots more
The same individdible doan't have the privilege
Of breathin' his own are & no one's else ;
Each one must take whatever comes to him.
O, Sextant, doan't you know our lunks is belluses,
To blo the fire of life and keep it from
Goin' out ; and how can bellusses blo without wind ?
And ain't wind Are ? I put it to your conshuns.
Are is the same to us as milk to babies,
Or water is to fish, or pendlums to clox,
Or roots and airbs unto a injun doctor,
Or little pills unto a omepath,
Or boys to girls. Are is for us to brethe.
Wot signifies who teaches if I can't breethe ?
Wot's Profs. & Professes to children who are ded ?
Ded for want of breth ! Why, sextant. when we dye,
It's only coz we can't breathe no more—that's all.
And now, O sextant, let me beg of you
2 let a little are into our school-house.
It ain't much trouble—only make a hoal,
And all the are will cum of itself.
It luves to cum in where it can git warm,
And O how it would rouse the childers up,
And sperit up the teacher, and stop gapes
And yawns & fijjitts." * * *

We have come to the consideration of

The means for changing the air in the schoolroom, the means for getting in this "kermoditty," and we shall find that there are two more little modifications in the "pome" which I would not make, for fear of spoiling its vigour by too much matter-of-fact, but to which we must allude when we come to the matter-of-fact subject of ways and means.

Whilst the air "doesn't cost nothink" "out dores," it costs a little (not much in proportion to its worth) to get it into the right place and "git it warm;" and whilst it "ain't much trouble to make a hoal," it requires much thought and time and trouble —and this all means money—to get the "hoals" in the right places, for different seasons and under varying circumstances. And it is this question of money, combined with a want of proper understanding of the consequences, and of the whole subject indeed, that stays the hand of those who have not yet appreciated the fact that the question at issue is of the value of children's and teachers' brains and bodies, *versus* the cost of a few ventilating tubes, and the ingenuity required to devise and manage them, and the cost of fuel and enlarged school-rooms.

Size of Inlets and Outlets.—First, then, what should be the *size* of the "hoal" or holes—for it wants some to let the bad air out as well as to let the good air in. This will depend upon the rapidity of currents of air that may be borne, and this again upon whether the air is warmed when introduced; but, as a rule, about five feet per second may be borne. There are 3,600 seconds in an hour, and we want 3,000 feet of air in that time, *i.e.*, five-sixths of a foot per second for each individual; this, with a current of five feet per second, will require our "hole," or inlet, to be one-sixth of a square foot, or twenty-four square inches, per individual; and the same to let the air out. If heated it will have to flow more rapidly, and it may more safely be allowed to do so.

Whilst I am speaking of heating, let me dispose of a popular fallacy. I think it is generally supposed that in winter people can more safely crowd together, and do with smaller air space than in summer. Unless the air is heated before it is introduced, the reverse of this is true; the air has to "git warm," as our poem has it, and consequently cannot be changed so frequently, unless we are to be chilled by it.

The next point in connection with the ventilation of the scchool-room, is

The relative position of the inlets and outlets. Their relative positions will vary much, according to varying circumstances; among which may be mentioned the shape and size of the room, the season of the year, the mode of heating. And let me here say, that the ventilation and heating of any room must always be considered together.

We shall not be able in the compass of this general paper to consider minutely all the varying circumstances alluded to. For a fuller description of details of some of the plans to be resorted to, I shall refer you to one or two papers within your reach. Some others we may consider somewhat in detail; and there are certain general principles which, if strictly remembered and carried out, will help us much in the consideration of details in each special case. There are four of these general principles that must never be lost sight of:

1. The air brought in must be distributed throughout the whole of the breathing space.
2. It must be of a suitable temperature when it comes in contact with the inmates, and of a suitable degree of humidity.
3. It must be pure.
4. Hot air is lighter than cold.

It is of great importance to bear in mind these four principles; it will be found that every defect in ventilation is due to a violation of some one of them.

In many of our school-rooms the feet are in Greenland, whilst the head approaches the torrid zone. The light, hot air is at the top of the room, the colder strata below. The air may thus be in a stagnant condition, or an attempt may be made to let the heated and supposedly impure air out by ventilators at the top. And now what happens? In rooms heated by stoves, just as soon as the air becomes enjoyably warm it flies out and away, the lower part of the room being always uncomfortably cold. Following out principles which I have expressed above, sanitarians in various places seem to

have hit upon a modification of the Ruttan method, which may be expressed thus: Cold, pure air is conducted so as to impinge upon the stove, or heating surface; here it becomes heated and ascends; meanwhile, at the sides of the room and close to the floor are outlets, sometimes funnel-shaped (of which I here show a sample), taking off air from the floor-line by means of pipes passing up through the room and connecting with the stove-pipe, with the chimney, or with the outside air. The air heated by the stove rises to the ceiling; cooling, it gives way to that which, expanding beneath it, rises to take its place; it falls over in fountain form, gradually settling down, till it is drawn down and out by the outlet shafts. This plan is illustrated and described in a paper by Dr. Cassidy, to be found on pp. 150-1 of the First Annual Report of the Provincial Board of Health, to which any person in this audience can readily refer.* You will see that a constant circulation of air is thus carried on.

I now proceed to show you a set of diagrams which came to my hand most opportunely whilst preparing this paper. They illustrate a series of experiments by an architect, Mr. Warren R. Briggs, and are published by the State Board of Health of Connecticut. They show how much more important than is generally supposed are differences in the relative positions of inlets and outlets in providing for the distribution of fresh warm air in all parts of a room.

Mr. Briggs' object was to determine by what relative arrangement of inlet and outlet the pure warm air could be best distributed throughout the whole of the breathing space—the carrying out of principles 1, 2 and 3, enumerated above. The mode of experimenting was to cause smoke to pass into the room through the inlets and out through the outlet flues, the latter being heated. The breathing line (the horizontal plane near which are situated the respiratory passages of the inmates) is indicated in the diagrams by a dotted line. The results obtained are thus stated by Mr. Briggs:—

"The air entering upon the outer wall at the floor, and being removed on the inner wall at the ceiling-level, does not benefit the occupants of the room as it should. The action of the air as it enters is rapidly upward to the ceiling, where it stratifies, then along its surface to the outlet, as indicated in Fig 2. The entering air is warm

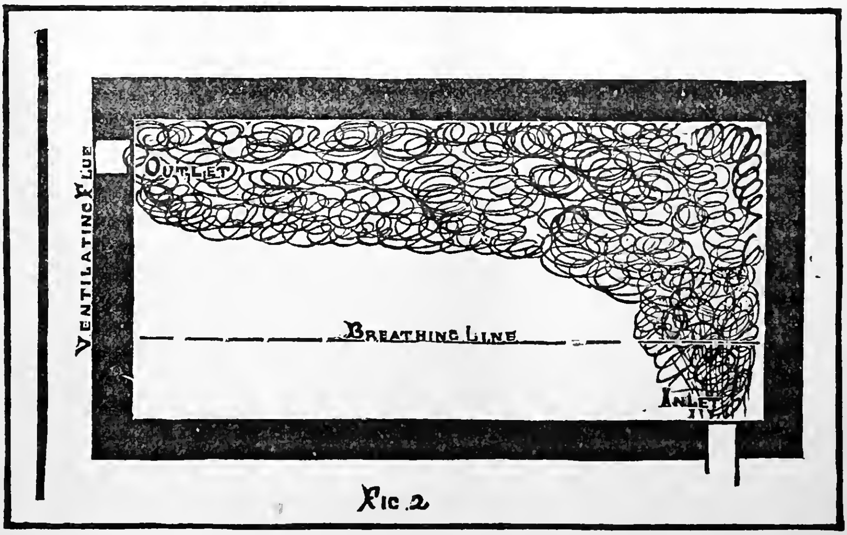


FIG. 2.

The plates illustrating this article have been kindly loaned by the State Board of Health of Connecticut.

and light, and naturally rises and flows across the top of the room to the nearest outlet. The foul air of the room, being heavy with impurities, remains at the bottom,

* The reports and documents issued by the Provincial Board of Health are distributed as extensively as the government grant will allow. Copies are sent to the following among other persons:—To the clerk of every municipality, to all school inspectors, to all medical practitioners whose names are on the Registrar's roll, and to the secretaries of Mechanics' Institutes.

becoming constantly more contaminated. There is no doubt a certain amount of radiation or mixing is going on, but the great bulk of the pure warmed air entering the room takes the short cut across it and up the chimney, as shown in Fig 2. This action of the warm air occasions, as may be readily seen, an enormous loss of heat, without accomplishing the very points aimed at, the utilization of every particle of heat before it is allowed to escape, and the thorough mixing of the pure incoming air with the air already in the room. If any one doubts the correctness of the action of air as herein described, let him fill the incoming flues with smoke, that can be readily seen, and watch its course as it enters, flows upward and outward, and see where the great mass of it goes. The dotted lines on this sketch indicate the breathing point of a person sitting."

"It may be well to explain that in these experiments the outlets have been at least *twice as large* as the inlets, and that there has always been heat in the outgoing flues to produce a strong up current, as I believe this to be the *only* sure way to produce a constant outward flow of air."

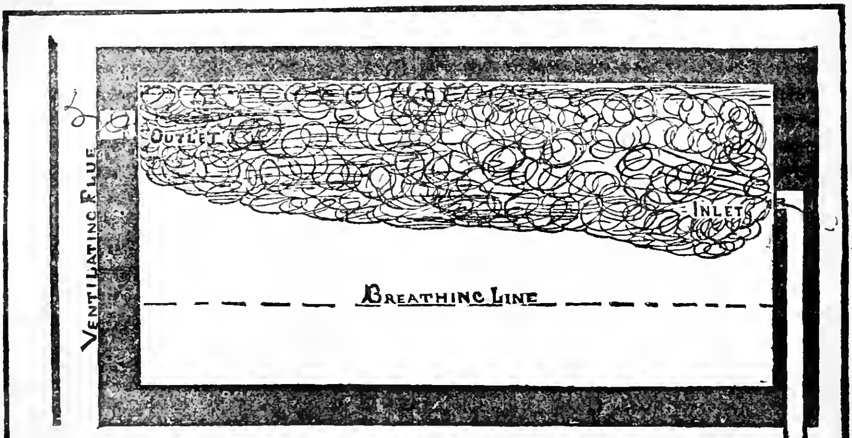


Fig 3

"In Fig. 3, the outgoing flue is in the same position, but the incoming flue has been raised about two-thirds of the way towards the ceiling."

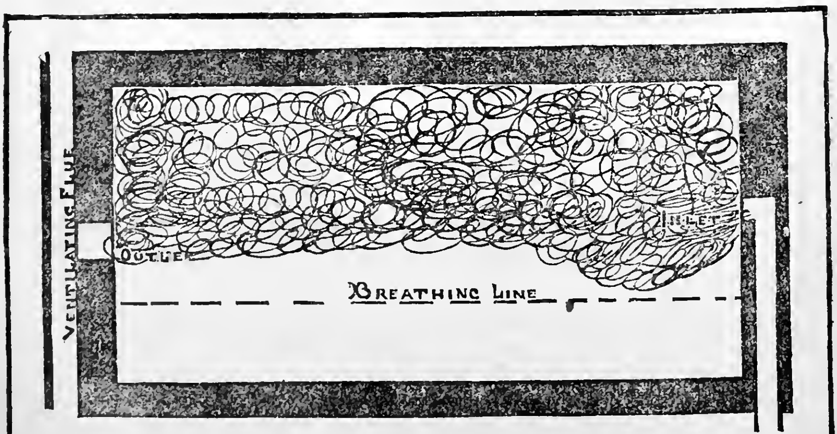


Fig 4

"In Fig. 4, the flues have been placed on about the same level, but with no better results."

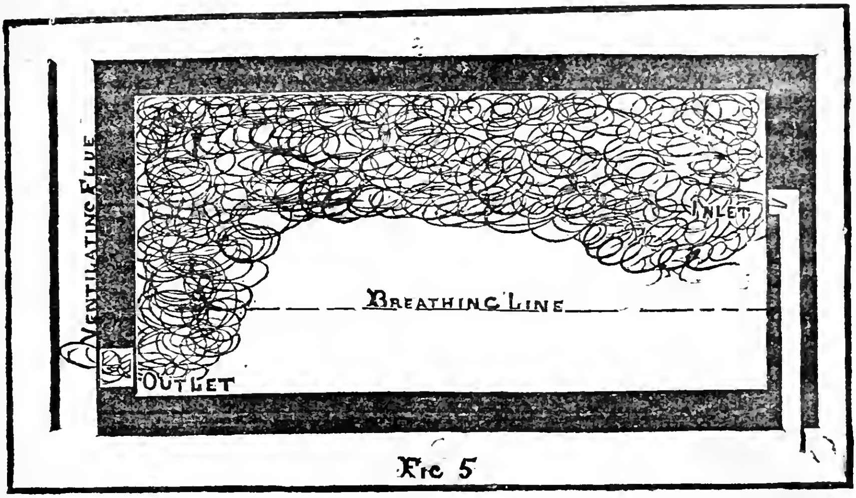


FIG 5

"In Fig. 5, the outgoing flue has been placed at the floor, with the results shown in the sketch."

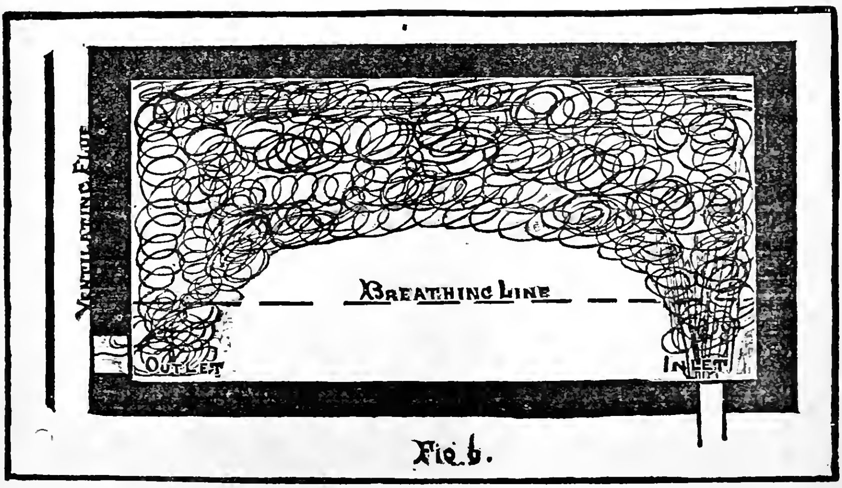


FIG. 6.

"In Fig. 6, both flues are at the floor-level, with better results than have yet been obtained, but still far from satisfactory. I have thus tried to show the general action of incoming and outgoing currents of air by the placing of the introduction flues on the outer walls."

*   *   *   *   *   *   *

"In the Bridgeport school the coil-boxes for the heating of the various rooms have all been placed in the main ventilating shafts in the centre of the building, and the air conveyed from them through these shafts to the rooms by means of metal tubes. The air enters the inner corner of the room about eight feet from the floor, the corner being clipped so as to form a flat service for the register opening; underneath the register the space is utilized for a closet for the use of the teacher. The outgoing flue has been placed directly under the platform, which is located in the *same corner* as the introduction flue. This platform measures 6′ × 12′, and is supplied with casters, so that it can be moved at any time it is necessary to clean under it. Its entire lower edge is kept about 4″ from the floor, to give a full circulation under it at all points. The action of the in-

coming air is rapidly upward and outward, stratifying as it goes towards the cooler outer walls, thence flowing down their surfaces to the floor and back across the floor to the outgoing register. By this method all the air entering is made to traverse with a cir-

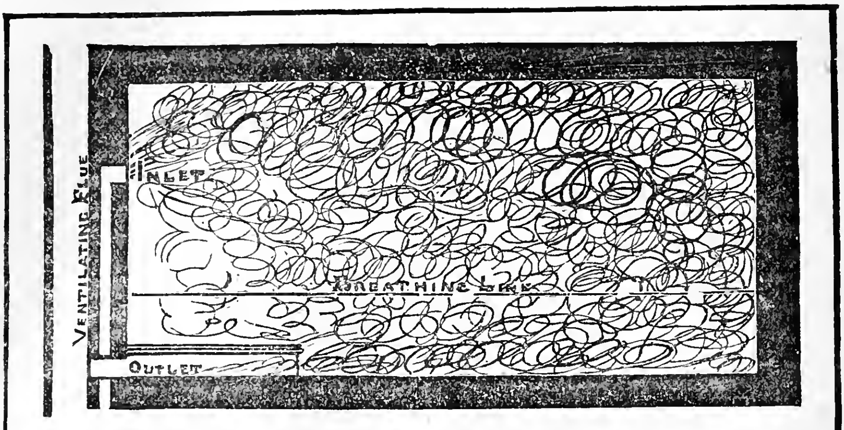


Fig 7

cular motion (see Fig. 7) the entire room, before it reaches the exhaust-shaft, and there is a constant movement and mixing of the air in all parts of the room. All the heat entering is utilized, and I believe that if the supply and exhaust-flues are properly balanced as to size, there can be a very small loss of heat.

"The inlets are all intended to be large, and the flow of air through them moderate and steady. The air is not intended to be heated to a very high temperature ; the large quantity introduced is expected to keep the thermometer at about 68° at the breathing level."

It seems to me that differences as to the results obtained even in this best plan (that indicated by Fig. 7) might arise in connection with differences in the several dimensions of the room. The Bridgeport schoolroom has a capacity of 13,000 cubic feet, and was 13 feet high.

I regret that I have not time to enter into other methods of winter ventilation and modes of introducing and distributing heated air.

I must now turn to methods af ventilating in warmer weather. Even in summer, in Canada, the air is not often of as high a temperature as our bodies, 98½° Fahrenheit. It is generally much cooler, and becomes heated by contact with us. Hence, put outlets in the top and it will rise to them and away. Then "make a hoal, and all the air will come in of itself." But the "hoal," if not of a particular kind, *may* sometimes allow the air to blow too directly on the teacher's neck, for example, producing unpleasant consequences, especially if it is already blowing hard out of doors. Hence, the teacher may not despise a few hints as to the various devices for breaking up a current of air, or directing it above his head, especially if the devices be of so simple a nature that he can, at once, introduce them himself.

1. One such may be adopted by raising the bottom sash of the window, and filling up the opening by a piece of board. You will not see much gain from this until you remember that a broad air duct has been thus constructed, opening upwards between the two sashes, and directing the current of air upwards.*

2. Double panes, with a slit at the lower part of the outer, and at the upper part of the inner, will act in the same way.

3. So will a board set in the window frame an inch or so inside the open sash.

4. Boards sloping upwards from the top of the upper sash may be used.

5. Perforated boxes running around the room, and having connection at one or two

* See illustrations, pp. 344 and 378.

points with the outside air, may diffuse small streams of " this commodity " from their numerous perforations.

6. Wire screens and other contrivances will be found described in some papers which will find place in our next Annual Report.

The third principle that I laid down,—

That the air must be pure,—it might seem almost superfluous to mention, and yet how often does it happen that the air supplied to our rooms—school-rooms as well as others—is taken from halls (where it has already done its part), from cellars, from dirty yards, and often, in addition, is made to traverse flues containing the accumulated dust and rubbish of months and years? I can point to several public buildings in Toronto where this, and worse, has taken place.

It would be very interesting to describe the various procedures for determining the purity of air and sufficiency of means of ventilation, but time will fail us, and I will merely show you a little portable instrument for recording the velocity of currents of air, and which would be very useful to those charged with the sanitary inspection of schools.

Fire Escapes and Ready Exit.—Before leaving the architectural part of my subject, I should refer to two other closely connected precautions for the saving of life. If I mention the Sunderland disaster, and the fire panic in New York, you will know what I mean. Good broad stairs, doors opening widely outwards, and efficient fire escapes, are some of the requirements needed. In this connection I would desire to allude in terms of commendation to the action of some of our school authorities in exercising the pupils in fire-drill, and would express the hope that this action may become more general, as also the systematic sanitary inspection of schools. A good work in this latter direction has been this year performd by the Medical Health Officer of Toronto, Dr. Canniff.

Closely connected with the subject of pure air in and around school buildings is that of the

Disposal of Sewage: but I have caused to be placed on the platform, a number of copies of a pamphlet on the subject, recently issued by the Provincial Board of Health; I will ask each member of your Association to take one, and read such parts of it as will apply to his own locality. And I would especially call the attention of School Inspectors, Principals, and Trustees to pages 6, 7, and 17.* If they will not adopt in full the suggestions there laid down, I would at least ask this: that if they have in the past been so thoughtless as to subject to disgust and inconvenience those who cannot, from motives of sensitiveness, allude to the matter themselves, they will, now that their attention is called to it, provide a remedy, and save, in this respect, much suffering and seeds of future ailments.

In regard to Drinking Water there is not much to be said under the head of School Hygiene that will not equally apply to hygiene in general. One thing, however, the teacher should look after for himself and the pupils, the condition of the filter. Filters are often used for months and even years without a change of their solid contents, except by the addition of a large amount of organic matter retained in a filter, and which becomes a source of danger.

Contagious Diseases.—I believe that in many instances, teachers and other school authorities are doing their best to battle against the spread of Contagious Diseases. And I feel sure that many of you are often annoyed and made anxious by accidentally finding out that some hidden source of danger has been lurking unknown to you in the midst of your little community. The only remedy for this will be based upon the carrying out of the provisions of the Public Health Act of 1882. By that Act, it is incumbent on every householder, and on every physician under whose charge has come a case of infectious disease, dangerous to the public health, to report the same at once to the health officers. When there is no specially appointed Board of Health, the members of the Municipal Council are the health officers. But many of these latter would not know what to make of it if they found disease reports coming in to them; hence, it is no wonder that the reporting of contagious diseases is largely disregarded. Many of our municipalities are

* Pages 214, 215 and 223 of this Report.

however, waking up; and in several the law is strictly complied with. The Provincial Board is endeavouring to have a Local Board established for every municipality or group of municipalities, and it trusts that you will lend your educating assistance and influence in that direction.

A greater discrimination should be made by some in regard to the exclusion of peasons associated with cases of contagious disease. I have known instances where the brothers of typhoid patients have been excluded from school—a proceeding quite unnecessary; whilst, on the other hand, the brothers of scarlet fever patients, and even the patients themselves, have returned before the peeling off of the skin has been completed. Do not let any person or thing associated with a scarlet fever patient return to the school till you have the certificate of the medical attendant that all necessary conditions and precautions connected with disinfection have obtained.

A few words now regarding Physical Exercise: I fear that into the schools the tendency has crept down from the colleges to run athletics mad. I have seen children with weakly organizations tempted by the incentive of a prize to risk their safety in a race of other athletic contest, and I have felt sorry for their little pale faces and fluttering hearts.

I noticed a year or two ago that in the schools of Lindsay the ten minutes recess was abolished, or to be abolished, and I was very sorry to see it. Oh, what a stock of sprightliness and of fresh, lung-expanding air the pupil can lay in during that ten minutes to carry him through the work of the next hour, and if the teacher can only set aside his dignity for that ten minutes, and mingle in the sports of the boys, it does him good, both in himself and with his boys, for the latter, without losing their respect, find out that the master really has interests in common with them, and was once a boy himself.

In regard to Mental Rest and Exercise, you have more than once listened to your old and eloquent friend Dr. Workman: that is enough said—except this, that I have always less fear of allowing children to occupy and amuse themselves with letters and slate-pencils at their own sweet pleasure, even though it be at an early age, than I have of burdening them with a confusing multitude of studies and long tasks after the commencement of what would be called by some the legitimate school age.

You have in your midst too many warm advocates of the further extension of the *Kindergarten system* to need that I should speak of the part it plays in the interchange and combination of mental and physical exercise, rest and recreation.

Defects in Vision and Hearing I believe, often get our school children into trouble, whilst, on the other hand, disregard of physiological principles in our schools has much to do with producing such conditions. These, however, have lately been considered in various quarters, as also has the effect which *ill-made seats* have in producing stooping, contracted chests, and even spinal curvature.

Clothing.—It may be thought by some that the teacher—at any rate, the male teacher—has not much to do with the subject of dress. Perhaps this is true, except in one particular, which I will mention in order to put teachers on their guard. I have seen children very ill, and one at least nearly lose his life, from being caught in a storm and obliged to sit in wet clothes. Sometimes, too, the thoughtless chicks may have been indulging in a good wading time in a neighbouring creek, in order to test a pair of new boots. Will the kindly teacher think it too much trouble to save his or her little pupil's life by an ounce of prevention applied in this direction?

Teaching of Hygiene in Schools.—One more point, and I am done. If School Hygiene or hygiene in general is worth anything, why not have it taught more extensively in schools? You may say: "What, after just speaking of the burdensome multitude of subjects at present being learned, or attempted to be learned." In reply I would bring this paper to a close by a quotation from a paper by Prof. Austin, of St. Thomas, which expresses my position on this subject. I may say, in explanation of one remark, that St. Thomas was at that time much exercised over the question of establishing a system of sewerage. Listen, then, to Prof. Austin, himself an instructor of the young:—

"But even should it be known that something now on the school programme would have to be omitted, we do not think this should prove an insuperable objection to the introduction of the instruction and training desired. The branches of the great tree of

knowledge have so multiplied in this day of scientific research that an eclectic course of study is a necessity, and the demand of the age is for the practical as distinguished from the theoretical and ornamental. Now what could be more directly and universally practical than the great laws that govern our physical relationships and the rules that should govern us in every-day life? If, then, a selection must be made, why not take the most intensely practical subjects? For of what use, so far as life is concerned, is culturing so highly the mind, if the body is too weak to bear the strain and pressure of life's battles? Of what use garnishing the jewels till their resplendent lustre dazzles all beholders, if both casket and jewels so soon are to be thrown into the pit? Why be so anxious to increase the size and value of the cargo, if the vessel is so poorly built that the storms will surely wreck her in mid-ocean? Now we are very much mistaken if this instruction and training for which we plead is not really more practical and important in every-day life than some of the subjects usually found in the curriculum of the school. Let us take, for example, ancient history. Outside of the professional walks of life, of what practical value is the amount of ancient history usually received at school? Leaving out of consideration the mixture of myth and mystery, of truth and fable, or error and exaggeration usually found on the historic page, can any one for a moment doubt that hygiene and physiology would be of more practical use to nine-tenths of our pupils than this branch of study? The very many questions which ancient history presents for our study and investigation may be interesting enough to the historian, and pleasant enough as a pastime, but to us in this practical age are not of as pressing importance as more recent problems. Whether Thebes had a hundred gates, whether Romulus did really found Rome, whether Alexander untied or cut the Gordian knot, whether the vision of Constantine was an illusion or a reality, may have been burning questions in the early ages, but after a lapse of a few thousand years they have lost something of their freshness and interest, and hardly arouse as much enthusiasm in St. Thomas as the burning question of the great sewer."

ARTICLE V.

THE WATER SUPPLY AND SANITARY ORGANIZATION OF GLASGOW; OR, A MOUNTAIN STREAM AND WHAT BECOMES OF IT.

(A Lecture delivered by the Secretary under the auspices of the Paris Union School Board, May 4th, 1883.)

Mr. Chairman, Ladies and Gentlemen,—Through the interest taken in all pertaining to health, whether of the individual or of the public generally, by the medical gentlemen of your town, I have been invited to speak to-night under the auspices of the School Board; and if there be anything encouraging to me as the executive officer of the Provincial Board of Health, it is this fact of the interest taken by our people generally in the matter of sanitary reform, since I have spoken, through invitation, to meetings under the auspices of Mechanics' Institutes, of County Teachers' Associations, of church societies, and to-night under those of a Board of School Trustees. In addition to the pleasure which your invitation gives me, I have another cause for pleasure, in the fact that the scheme set on foot here for giving to the town a supply of good water enables me to take for my subject something new, I having discussed within the past six months a very considerable number. My subject, besides being one concerning water-supplies in general, refers to the special water-supply of a city with which many here must be familiarly acquainted, while all must have read of that mountain loch—

> "Where, gleaming with the setting sun,
> One burning sheet of living gold,
> Loch Katrine lay beneath him rolled,"

as described to us by Scott in his inimitable "Lady of the Lake."

It is my intention this evening to give, in a discursive sort of way, the story of a mountain stream, by speaking of its origin and of its strange eventful history. It will be proper for me to tell you not only how it has gone to form

"The darkening mirror of the lake,"

on which romance has pictured Roderick Vich Alpine Dhu being rowed by his faithful clansmen, singing as their chief advanced toward Ellen's isle,—

"Row, vassals, row! for the pride of the Highlands!
Stretch to your oars for the evergreen pine!"

but also of the modern wonder and triumph of science, by which the mountain-stream has been led many miles to supply the teeming city which has grown up on the banks of the Clyde, and which is a magic development of the old monastic community of good St. Kentigern by the side of the Melindonar burn in the vale of Strathclyde.

Far to the westward, where the Atlantic rolls its surges, warmed by the Gulf stream, into the narrowing inlets of the Firth of Clyde and the Kyles of Bute, old Ocean is ever yielding up vapours to the circumambient atmosphere, which borne inland breaks upon—

"Mountains that like giants stand
To sentinel enchanted land;"

upon snow-capped Ben Lomond, and upon Ben Ledi, Ben Venue and Ben An. These vapours, invisible in the air, as was Nephale in classic myth when borne away by the steeds of Helios, shrink at the touch of those grim mountain giants, and in mists and crystal water-drops are shed upon the hillsides, gathering into a thousand dashing burns, rushing torrents and winding streams. Thus, year after year has Neptune paid his debt to Helios; Helios has yielded the treasure to these Titan mountain-forms, while these have either hurled them in anger upon the quiet vales below or in neglect have allowed them to wander, winding here and there in their course down the mountain-side, bathing the heather-bells and solitary junipers, clinging to what but shortly before had been parched and sun-dried crags. But these bold mountain-peaks, standing sentinel over the vales, straths and passes of the Highlands, in which embosomed lie Loch Katrine and the whole group of mountain lakes, deserve more than a passing notice. Says M. Reclus, in his fascinating little book, "The History of a Mountain," "How often has a peasant, uncovering his head, pointed to the sun, and solemnly said to me, 'There is our god?' and many a time have I been compelled by real feeling, at the sight of lofty eminences enthroned above valleys and plains, to call them divine." Thus discoursing of the mountaineers and mountains of the Alps, he tells how mountain-worship has existed during all time amongst tribes of the Caucasus, of the mountains of Armenia, and of the lofty peaks of the Himalayas. But we shall extend this discourse of Reclus to the mountains of these Scotch Highlands. They have made a nation and have created history. See yonder mountain, Ben Ledi, overlooking the Trosachs, the pass to the braes of Doune and the Lowlands! There, rising rock above rock, clothed with birch and the aspen, thence extending into crag above crag of the cold, grey whinstone, clothed with bracken, furze, and the heather, the mountain bare, over-hanging and threatening, finally hides its summit in some black, gloomy cloud or translucid mist, in which some dimly-seen pine or fir tree stands out as if it were the spirit of the storm-cloud.

"The mountain mist took form and limb
Of noontide hag or goblin grim."

But these mountain peaks recall too, the story of that world-making period when up from the shoreless ocean was pushed a plastic mass of inorganic materials in some world-convulsion, and was left to harden into the uncouth shapes which volcanic rocks present; while between these giant peaks—

"Crags, knolls and peaks confus'dly hurled
The fragments of an earlier world,"—

remained the quiet vales, prepared to receive into their stony bosoms the mountain torrents of a later time.

But of these mountains, streams and lochs of the Highlands, we must confine our attention to-night to Loch Katrine and the sister lakes grouped together in the several vales, situate between Ben Lomond, Ben Ledi, Ben Venue and Ben An. I have already referred to their classic fame in the realm of Scottish history and romance. But not more interesting is that romantic past than is the present with its scheme of sanitary benefits fully developed. The mountain torrents, which gather

"Where stern and steep
The hill sinks down upon the deep"

converge in the valley as Loch Katrine, and uniting with others go to form Achray. These again rolling along to where

"Vennachar in silver flows"

are all finally gathered into one, reaching—

"That torrent's sounding shore,
Which, daughter of three mighty lakes,
From Vennachar in silver breaks."

This stream of beauty passes rapidly into the plain, there becoming the sparkling crystal-flowing Teith, which, debouching into the Forth, is carried through the Carse of Stirling down through the Links of Forth, and is finally lost in the floods of the Firth, its waters uniting again with their parent ocean.

But, in flowing down the mountain-sides, these limpid streams, by chemical and mechanical action, have ever borne along with them particles of the trachytic and granitic rocks over which they passed to the lakes below.

"And heaped upon the cumbered land
Its wreck of gravel, rock and sand."

We see, however, that these materials were, for the most part, of inorganic, mineral matters, which, as we shall see, are ever found in wholesome springs and streams; while the rock basins of these lochs are of such a character as to leave the waters unpolluted with such organic materials as might be prejudicial to health.

Such are the sources, such the nature, and such the location of the water-supply of the ancient city of the Clyde. Accurately stated, the supplies brought into the city are composed of the following extents of surface :

Loch Katrine has	a surface	area of	3,000	acres.
Loch Vennachar	"	"	900	"
Loch Drunkie	"	"	150	"
			4,050	"

—thus giving a cubic area capable of supplying water amounting to 1,600,000,000 cubic feet.

The drainage area, or the mountain streams which empty their foaming waters into these lochs, extends over 45,800 acres. The rainfall annually, or the number of inches falling upon this surface, = 80·90 inches, in fact an almost tropical rainfall.

Thus it is, we see, that the waters of these lochs, which, flowing by Coilantogle ford, passed the Deanstoun and thus mingled with the Forth, are now to flow through tunnels and aqueducts to the gates of the city into which Britannia's queen with regal touch turned the streams to supply life-giving waters to thousands of a needy humanity.

But ere we speak of the part played by the 50,000,000 gallons of water daily supplied by mountain streams, in the life of such a mighty city, it will be well for us to look back briefly upon the city as it has existed in the past. In this way we may be enabled more clearly to appreciate the value of the lessons to be learned to-night. A hundred years ago the city of Glasgow did not contain more than 70,000 inhabitants; while extending our gaze further into the past, we find the town of Strathclyde, mostly centred around a few streets, such as the High Street, Trongate and Salt Market. Besides these there were fishing booths along the Clyde, then a famous salmon stream.

It will at once appear evident to all that the sanitary conditions present then, however bad, must from the small population, have been much mitigated.

Indeed it would appear that in the last century Glasgow held an enviable reputation for beauty and salubrity, since we find Defoe then writing, to the effect that this city of the "Tobacco lords" was one of the cleanliest, best built, and most beautiful of Great Britain. Glasgow, as every other city of the old world, has its period of legend and romance. We are informed that St. Kentigern sometime in the sixth century, built there a monastery occupying the ground where St. Mungo had his cell, on the banks of the Melindonar burn. But the city in later centuries partook of the changes which all the kingdom underwent. It became a royal city and had its far-famed cathedral begun in the twelfth century. We find, too, that sad experience in those olden days taught the people something of a knowledge which we are now standing much in need of. In 1588 the plague prevailed in many districts, and we find the Glasgow Council establishing a quarantine against Paisley, preventing any of the towspeople visiting this place where the plague was; while in 1589 we find that an order was passed providing that "na middings (refuse) be laid upon the Hiegat." We further witness the admirable self-satisfaction and complacency of the educated (?) *doctors* of that time, as we find the Faculty of the University, instead of exerting their energies and occupying their time in investigating the causes of disease, retiring to the *toun* of Irvine for quiet contemplation *tempore pestis* as the records have it.

It seems, however, that even in those times, as at the present, town by-laws were transgressed or ignored, and their enforcement neglected; since, in 1655 so great a collection of *middings*, or rubbish was present in the town that the inhabitants in many cases had to make stepping-stones—*brig-stanes*—from their houses to the street. This accumulation was due to the people in the Trongate, High-street, etc., being accustomed to throw out their ashes and other refuse into the streets, while the spaces between the houses received all sorts of refuse. In 1666, the time of the Great Plague, an order was passed in the following words: "that the *syre* (sewer) in Trongait be levelled and made straight for conveying away water, since divers cast in *stra* (straw) to *mak* a way, so that filth and *myre* (mire) is made to be seen in the gutters *quhilk* (which) is very loathsome to beholders." But these were not all the *beauties* inherent to the Hiegat of Glasgow at that period. It had *swyne* running at large in it, skynnes heaped in it, peat and hay-stacks were built in it; while butchers used the sides of the public streets for slaughtering cattle, "and raised ane filthy and noisome stink, which flew to all manner of persons that passeth that way through the King's street."

By the end of the seventeenth century, we find, however, that they were improving this state of things which we have described, since "the sywers were ordered to be kept clean, the streets and closes to be swept, and refuse to be taken off the streets." It was about this time, too, that the notorious *gardyloo* was prohibited. This time-honoured custom, long since happily disappeared, is interesting enough as showing us something of the every-day manners of life in earlier times. The expression explains to us its origin, since it is the Scotticized form of expression for the French, *gardez l'eau* "beware of the water," and refers to the regulation, that between the hours of seven and eight, morning and evening, the public passers-by were to take the middle of the street instead of the sides, since by this means they would be preserved from a drenching with the slops cast from the windows of the many-storeyed houses, by the not too careful house-wives, who gave vent with their bucket of slops to the expression *gardyloo!* But though, according to Defoe, much improvement must have taken place toward the close of the last century, yet the city's beauty must have been relative rather than absolute, since none of the streets were causewayed, and were in great disrepair, while 1780 saw the city unlighted at night with street-lamps.

Regarding the water supply of the ancient city, we have already seen that the Clyde, and the pretty burn of Melindonar, or Molindinar as now called, afforded the chief supplies of water. In 1736, however, it appears that wells were the chief sources of water supply, since there were some sixteen public wells, and a number of wells in several *closes* of the town. Of course there were no baths in the houses. Here, as everywhere,

the wells of those olden times, had many a legend connected with them, and from which they received special designations. Some of the principal Glasgow wells were called by the suggestive names of the Meadow-well, the Bogle's Well, the Priest's Well, and the Lady-well. It appears, however, that in 1776 an attempt must have been made to obtain some more extended supply for this growing city of the tobacco and cotton lords, since the old city records show that the town treasurer was ordered to pay Dr. Irvine £8. 8s. for searching for water to be brought into the city. In 1804 a Mr. Hardy built a reservoir and sold water from the springs. In 1808 the Cranston Hill water-works supplied the city pretty thoroughly with water; while in 1846 was formed the Gorbals Water-works Company with a reservoir on the high grounds to the south-west of the city. But there were a number of reasons why it was desirable that another water-supply be obtained. The city, which at the end of last century had contained little more than 70,000 of a population, had increased up to nearly 600,000, and had become one vast hive of productive industries. A more important problem, however, than either of these was presented for solution, due to the fact that the supplies were impure as well as insufficient. Hence as early as 1848 a by-law was introduced by the city council proposing an expenditure for the purpose of bringing the waters of Loch Katrine into the city. It was defeated, however, nor was it until 1855, when again introduced, that with difficulty it was carried, aided by the great influence of Lord Palmerston. To Mr. J. J. Bateman, an engineer, was the work of bringing those mountain streams centred in Loch Katrine, a distance of thirty-four miles, entrusted. There was no difficulty about its fall as the Loch stood 360 feet above tide-mark at Glasgow; and this pressure is enough to carry water eighty feet above the highest building. It is brought by a combined system of underground tunnels, built tunnels, aqueducts and pipes of iron. There are in all seventy tunnels, twenty-seven aqueducts—one tunnel being sixty feet below the surface. Some twenty-six miles from Loch Katrine and seven or eight from Glasgow, is a large reservoir of seventy acres in extent, capable of holding 500,000,000 gallons of water. This, filtered through sand, supplies the city with 50,000,000 gallons daily, or forty-five gallons to each individual per diem. Its total cost has been £2,000,000, and water is supplied to each household at the rate of 8d. per £1 of rental, and at 1d. in the £ for public purposes—in other words, the householder paying $100 a year of rental, gets his water for 13s. 4d., or about $3.50.

Having traced the progress of the old village located by St. Kentigern on the quiet abbey lands upon the Melindonar to this modern time, when the annual tonnage of ships built upon the waters of its once fair river amounts (in 1877) to 169,303 tons (all Britain being 450,000); having touched upon the daily habits of life of its old time citizens; having spoken of the attempts which they made to quench their thirst with *aqua pura*, when they were not using *aqua vitæ*, and of how they have at last developed a magnificent idea by which they may, without difficulty, keep themselves hygienically clean, it may now be worth while to consider some of the effects of the early unsanitary conditions prevailing in the closes, wynds, and public streets even of the city, upon health, through the contamination of the water supplies; and to show how, by present sanitary regulations and an abundance of pure water brought into the city, from those far-away mountain streams its health has been improved in a very high degree—although, as everyone must know, there is much even yet remaining to be done.

Other things being considered, we may say that the hygienic progress of any city, town or village directly depends upon the thoroughness with which the various kinds of filth, mostly of an organic character, which accumulate within and around human habitations are disposed of. As remarked by Dr. John Simon, Medical Officer of the Local Government Board of Great Britain, "when an epidemic of enteric fever, or of cholera, or diarrhœa, has been traced (as in general it readily can be) to some gross excremental pollution of air or water, the primary source of such pollution will usually be under one or more of the following three heads, viz.:—faults of public sewerage, faults of indoor water closets and other apparatus of house drainage, and the fault of bog privies. The public sewerage may be at fault in two ways: first, in absence of sewers, so that slop-waters and other liquid filth, if not disposed of on the private premises, have to pass without proper tubular

conveyances along public ways, or in open and generally very irregular channels meant only for rain-water, where necessarily they must stagnate and stink and soak; secondly, in the existence of sewers which, in themselves, are more or less mischievous."

But while all these excremental pollutions are dangerous in themselves, there is another danger from them which the general public may not comprehend equally well. Most, here, know that such are composed largely of *organic* materials as opposed to so-called *mineral matters.* In a general way, we may say that these organic matters are composed of carbon, hydrogen, oxygen nitrogen, and sulphur, present in them in varying amounts. Now, from these materials, all further know, experimentally, that gaseous products, often sickening and malodorous, are given off—being ammonia, and sulphur and hydrogen compounds for the most part. But experiment has, time and again, proved that such gases, though nauseous and ill-smelling, are not the causes of those diseases, which, like typhoid fever and cholera, can be directly traced to filth. The question then arises, what are the causes of these, if not the gases which result from decomposing filth? I shall endeavour briefly to explain. Supposing that we take a very small amount of this filth, which collects in our yards, in our eave-troughs, in our wells, in our cisterns, in our dust-bins, and so on, and place it in a perfectly clean beaker glass, and cover it with distilled water from condensed steam. Let us leave it exposed to an ordinary warm atmosphere for a few days—a week or so. Now if we take a drop of the water and examine it under the microscope we shall find that it contains innumerable beings of various forms, which apparently have been feeding on the organic materials. That this is the case will be seen if we leave them in the fluid for a length of time, when the fluid will have ceased to smell disagreeably, and these microscopic beings will to a very large extent have sunk motionless to the bottom of the solution. Now that these beings have played some very important part in the solution, can be proved in various ways. For instance, if we had placed this solution in a position where no air could have got near, say in a corked bottle, very little gas, and comparatively few microscopic beings would have been developed. Possibly I may illustrate this better by an example most here are familiar with. Take some crystals of sugar, add distilled water to them, and so place the solution that no air comes in contact with it. Add a particle of the so-called mother of vinegar to it, and keep it absolutely free from the air, and practically no change will take place in the solution. Suppose however that we leave it exposed to the air, and we shall soon find out a difference; an effervescence will take place in the solution to some extent and it will gradually become sour. Place a drop of it under the microscope and we shall find myriads of little cells moving about in the solution. They are simply the cells of a microscopic plant, which feed upon such solutions, and as it were transform in their rapid multiplication the sugar solution into vinegar and carbonic acid. This action is all the greater if a minute amount of some material as white of egg be added to the solution. Now in the same way these various other organic materials supply food upon which microscopic beings now ordinarily called bacteria multiply and develop.

Thus it cannot appear strange, where one little being may induce the fermentation that produces vinegar; another that which produces alcohol; another that which produces mould on bread, etc.; another the decay in apples, that there should be other bacteria, which, developing in organic materials suited to them, should produce such specific diseases as typhoid fever, cholera, diphtheria, etc., when taken into the blood of patients, whose systems may be in a receptive condition. We have remarked that in all these cases liquids, or at least moisture, have always been present when the fermentation has taken place; but we can readily prove that, though these germs or bacteria cease their activity, and appear simply as dried particles of inanimate matter when the water is evaporated from them, their vitality is still intact; for we need only to add a little water when they resume their wonted activity. By this demonstration we can readily understand how, when dried out, such germs are carried into the air, floating therein, and being taken into the system so create disease. Hence we see how it is that no organic matter exposed to the appropriate conditions of moisture, warmth and oxygen can fail to undergo some of the many decompositions or fermentations induced by particles of living matter, or *microbes.* Now, one word may be said as to how such may get into the blood of man, and there finding conditions often most favourable for their development, produce some so-called *zymotic* disease.

Of course dust accumulates on food; and the more unclean the surroundings are, the more rapidly contaminated will food become. Such germs are undoubtedly common in the air; but especially will they be present in the dark and dismal atmospheres of filthy closes, yards, streets, cellars, and unclean, ill-ventilated and crowded living apartments. Now, allow all these sources to pollute the cleanest water, whether the purest rain-water, the limpid spring-water, the mountain stream, or the best of river supplies, and you have in it filth pollution—living germs of which will, without doubt, bear their legitimate fruit, viz., disease. How these conditions have borne the fruit of disease and death in Glasgow in the past, and how even yet they in some measure exist, a brief description of some of the older parts of the city may serve to show.

On examining any old map of the city we find that it was limited to a space in extent not equalling that of your openly built town. Within the area limited by such old streets as the Highgate, the Trongate, the Gallowgate, the Saltmarket, etc., lived the people up to the end of last century. Since that time, as we have seen, there has been an enormous expansion of the city population and city limits; yet though many of the well-to-do people moved from these old streets, still their denizens were ever becoming poorer and more wretched while their numbers kept increasing. Such indeed was the wretched condition of this district in 1860, that its population rated from 400 to 1,000 souls per acre; while dark courts, tenements still more dismal and foul, and an atmosphere impure, malodorous and reeking with filth were the fertile breeding-places, and prolific sources of diseases varied, and deaths innumerable. So fatal were the effects of these courts, and alleys and tenements that the mortality amounted to 70 deaths in every 1,000. They were the dark haunts of vice of every kind, and the scenes of crimes mysterious and terrible, the perpetrators of which only too frequently escaped punishment. To many here who have never seen any of these wynds, closes, courts and tenements, a brief description of such an one as I have frequently entered may be of interest. Entering from a narrow street, with buildings of great height on either side, a low arched doorway, upon the lintel of which appears the crest of some noble family of the olden time, and proceeding along a dark passage where a crowd of dirty, ragged and ill-fed children are at play, one soon emerges upon a quadrangle or court, upon the sides of which open common stairs. Ascending any one of these, a person is in a dark winding stairway, with roof often so low that he is required to stoop. The steps may seem to have been comparatively recently washed, but the filth of the past, if not of the present, seems ingrained too deeply for removal. As he further notices the stone steps, worn down several inches, he thinks of the generations after generations who have passed down them for the last time, borne by their fellows, to be with those who yet had preceded them to some such quiet resting-place, as that where the thousands lie under the slabs of the old cathedral yard, by the banks of the Molindinar, their names even, obliterated from the stone by the storms of many succeeding winters. Having reached the first angle of the stairway, a low doorway, possibly not more than four or five feet high is encountered. Knocking thereat, one is bidden enter the abode of wretchedness, admitted in his capacity of medical missionary. In the dim light admitted through a small square window, opening on some area, he may perchance see the remains of gentility in the fragments of some gilded cornice and frescoed ceiling, and mayhap some family crest; but he never fails to see the device of wretchedness and poverty engraved on all. On the old tester-bed with clothing scant and filthy, lies some wan, pale-faced and suffering mother, while about the floor are several young children, ill-fed and wretched-looking, yet too young to go into the alleys and closes to play. All is wretchedness, and oh! so often want; yet never in such an abode of squalor, have I known that which cheers and inebriates lacking, nor felt the absence of a rude hospitality to press it upon me. Such is a single room! Pass on upward for four, five and six flights, and one finds these terrible conditions increasing often as he ascends. Remember that large families may not possess what would make two fair-sized rooms, and think that such tenements are to be found up every common stair, and many stairs opening on a single court or close, and then after all these you can have but a faint idea of what Glasgow or even Edinburgh meant twenty or thirty years ago!

Does any further explanation seem necessary concerning the fatalities pressing upon the people of the olden time, and of conditions which even to-day sign the death-warrant

of so many? Foul and poor must be the food of such; contaminated the water taken from the wells in the courts and closes, and from those old public wells though blessed by a St. Margaret or St. Ninian; while concerning the air of the rooms occupied by these too often wrecks of a sad humanity, the absence of sunlight, the impossibility of ventilation to renew the atmosphere reeking with smoke, with the multiplied exhalations from the lungs, and the unwholesome emanations from the body, all make us wonder not that so many died from them but that any whatever should have escaped death.

It was with such facts and such scenes ever before them that some of the more benevolent and progressive citizens of Glasgow were led, as far back as 1860, to attempt a remedy, by buying up the buildings in one most notorious close. This radical method of improvement was begun in earnest, however, when the City Union Railway bought a right of way through the heart of this district. Mr. Blackie introduced an Act, which was passed by the Council in 1866, for the buying up of all the property occupied by these crowded closes and tenements. A Mr. Carrick drew up plans for improving the district by removing old buildings, widening the streets, and leaving open squares and breathing-places. By 1880 some ten thousand houses had been destroyed, and fifty thousand inhabitants had been forced to find other places for habitation. That the effects of these stringent regulations and progressive works should be most favourable to health was only to be expected. Such has really been the case. In 1860 Glasgow was one of the most unhealthy cities in Great Britain; in 1877 its mortality was reduced to equal that of London.

Thus in 1866 it equalled	....	29·6	per 1,000
" 1875 "	....	28·7	" 1,000
" 1876 "	....	25·2	" 1,000
" 1877 "	....	24·9	" 1,000
" 1878 "	....	25·0	" 1,000

But while we have seen how the attempt, with its first object of removing centres of misery and crime, has resulted most beneficially in the direction of public health as well, we must not suppose this desirable end to have been attained in a day, or that the simple removal of these old tenements and the increase of air-spaces have been the only means taken.

Glasgow has, for a very considerable number of years, been under the supervision of a Board of Health, whose authority and efficiency have been steadily increasing. I propose now to explain to you very briefly some of the other sanitary reforms that have been inaugurated and in a large degree successfully accomplished in this progressive city of modern industries. As all who will consider for a moment must be aware, the means for the removal of the excreta from the thousands of premises in such a city was in the olden time and even the early part of this century extremely imperfect, even though some attempts were made to remove the street-sweepings and refuse from dust-bins. As everyone is aware, the adoption of a system of house-closets has to a greater or less extent followed in every town the introduction of a public water-supply. Such has been, and is increasingly, the case in Glasgow. It implies, however, that if such are to be a benefit, a thorough system of sewers must at the same time be laid down. Now, the work of sewer-making has been an experiment requiring for its success an intimate knowledge of the laws of both hydraulics and mechanics, and of chemical physics. Hence it has been a work, the history of which has been marked with many imperfections and partial failures. However, while this work has been fraught with many difficulties, partially due to the practical engineering and other difficulties, and largely to the aversion which municipalities, through an ignorance of the dangers to be avoided and the advantages to be gained, have shown toward the granting of money for such purposes, yet we may say that in spite of all these, enormous strides have been made in many older lands, but notably in Great Britain. There are some 1,500 Local Boards of Health in active operation, and the great proportion of the towns has undertaken some system of scavenging and the disposal of excreta. But everywhere there has been a transition stage accurately marking the advance of the people in their knowledge of sanitary laws. In this, Glasgow has been no exception. Its Board of Health has not

only undertaken the work of keeping the streets and closes clean, but has also grappled with the problem of the removal of the excreta and house-refuse from 100,000 houses ere its presence and decomposition have become the condition for exciting the manifold ills arising from filth in its protean forms. Let us see how this has been managed. Dr. J. Netten Radcliffe, in his Report to the Local Government Board, 1873, remarks that when he and Dr. Buchanan inspected the sanitary arrangements of Glasgow they found middensteads of enormous size, filthy, fetid and uncovered, in existence, and attached to the great proportion of houses.

At the time of writing (1874) so great had been the advance made that, distributed between the 100,000 houses, there were of—

Water-closets	31,927
Pail-closets	4,365
Midden-closets	1,278

He further remarks that while the whole tendency is towards the adoption of house-closets in the new houses, yet as their adoption in the old-time tenements would be very difficult, the adoption of some other system is necessary. Now, while the disposal of excreta by the water-closet system may with comparative safety be left to the more intelligent and respectable members of the community, yet in these matters it is found that amongst the lower classes of houses and poorer portions of the community the constant supervision of the health authorities is necessary.

In Glasgow, the city for scavenging purposes, is divided into six districts. The removal of the contents of ash-bins, pail-closets, etc., is accomplished between the hours of 11 p.m. and 8 a.m., the staff consisting of 65 carts and men, and 60 emptiers. The quantity of stuff removed weekly to the various depots is computed to equal 2,000 tons, and is sold at the rate of 1*s.* 6*d.* per ton.

The entire cost of the scavenging for the year 1872-3, was	£46,295
Sales	17,493
Net cost	£28,782 = $143,910, or 25c. per capita.

Experience there has taught that the corporation authorities can do the work most cheaply and efficiently.

When such a system of refuse removal is carried to perfection, as in Rochdale, where the whole materials are turned into an artificial fertilizer, the proceeds of sale almost equal the cost of removal.

But the following up of our mountain stream, as it proceeds on its rounds of mercy and blessing through the city of Strathclyde, may yet afford us some lessons of interest. What are some of the errands on which it goes? On the streets, in the alleys, closes, and wynds are hydrants, where the water is frequently turned on, while the scavengers sweep all the refuse and dust which have accumulated into the gutters, whence it is carried directly into the sewers. Besides this, public fountains earn the gratitude of the thirsty multitude, by supplying an abundance of water of undoubted purity.

On entering the houses, the same limpid stream is found, from which the people may drink with safety, while the virtue of cleanliness can be practised to almost any extent. But, again, the great pressure which it receives, due to the height of Loch Katrine, enables it to flow with force into every house-closet, and when those are at all well arranged, to sweep everything into the mains. Once there, all is borne swiftly away by the trunk sewers, into which the floods of water are borne from thousands of sources.

The chief objection which we must have to this system of sewage disposal, must ever be its pollution of rivers and streams. When such cities, as in most cases they are, are built upon large rivers or arms of the sea, the objection need not be a great one; but when such excreta are poured into a small stream, they may, in some cases create nuisances of a disagreeable if not dangerous character.

I may advert very briefly to some other necessities required by the disposal of

sewage by the water system. It is too often supposed that the disappearance of sink and refuse waters is all that is required. But the absence of traps on soil pipes, of too small amounts of water used, leaks in house-drains and soil-pipes have been and are dangers which have too frequently produced fatal effects.

But, ladies and gentlemen, I cannot be expected to close my address to-night without referring briefly to the enterprise which you, as a town, have undertaken.

Many of you may not have thought of the fact that, through your very midst flows a mountain stream, winding its way toward our pure cold lakes and thence to the ever restless and homeless ocean. But, concerning this stream, I may presently give you a little piece of history which may surprise you. Some eight years ago, when a student of science at the University, I began, as a holiday recreation, some geological excursions along this my native river. I began at the brick-clays and gravels on the river below Brantford; thence, with a companion, I made an excursion to the pretty spot where Whiteman's creek enters the river. At that spot was an interesting outcrop of rock and traces of gypsum. But the knowledge gained of the gypsum formation at that point made me eager for more, so on another occasion I visited Paris, where, wandering along the river-bank, I met one of the miners, who was good enough to show me the gypsum quarries. I shall not presume to describe them, as they appeared to my enthusiastic geologic eye, to this audience, but need only remark, that one thing which, as I remember it now, most struck me was, that upon the roof of limestone rock, which overlaid the shaft from which the gypsum is taken, were some extremely pretty specimens of mineral, called, by the miner, *comb*. As it appears to me now, it had a thickness of about one inch, and was composed of the beautiful prismatic needle-like crystals of what is, I believe, the hydrated carbonate of lime, or crystalline limestone. But it is to the probable formation of this I wish to direct your special attention. Overlying this clayey limestone formation in which the gypsum occurs, is, if I mistake not, a clay loam with pebbles, for the most part of a limestone gravel. Well, down through this loam the rain, and snows as rain, gradually soak and so percolating, reach the stratum of rock. Now, although many would not suppose it, this solid limestone absorbs a certain amount of water, and this gradually finds its way to the roof of the shaft. From this roof drips the water drop by drop—each drop, however, having held a certain dissolved amount of rock in solution. Arrived at the surface, where the water keeps gradually evaporating, the dissolved particles, again assumed the crystalline form and produce the comb. Such, I believe, is the history of the formation of this so-called comb; but, whether right or wrong, I have, I trust, made clear that rock even absorbs water, and that the water dissolves minute particles of matter and holds them in solution.

Pursuing my explorations, I journeyed to Elora, named so, it appears, because with its caves in the lofty limestone rocks along the Irvine and Grand, it is something like a place similarly named in India. Here again, searching the caves for fossils, I noticed the same fact of the water drip dripping from the vaulted roofs, bearing with it particles of carbonate of lime in solution, which, as the water evaporated hardened into fantastic stalactites and stalagmitic forms on the roof and floor of the caves. Thence I journeyed to Fergus, but proceeded no farther up the Grand, taking its origin for granted, This origin, we are informed, is in the townships of Melancthon and Artemesia among the forests and swamps of that wet district. But have I not called the Grand a mountain stream? Well, so it is, since the land of those townships has a height of about 1,700 feet above the sea; and there the mists and vapours from Lake Huron and Georgian Bay, falling as rain, form rivulets, which, converging, become our noble river. We must remember that we have in this portion of Ontario a central plateau of considerable height, being 1,000 feet above Lake Erie, which is nearly 600 (573) feet above the sea-level. Unfortunately for scenery, this plateau has not its crags and peaks, but still this is most fortunate for the wealth of the Province. And since we have the Highlanders in this country engaged in the arts of peace, there is not the same necessity for mountain passes and ambuscades, for, having no Roderigh Dhu, we can have no Coilantogle Ford nor Ellen's Isle.

The chief point we have to remember in this geological digression is that the solvent

power of the water enables it to hold much mineral water in solution, while, as we know, much organic matter may be either dissolved or suspended in it as well. Now, it will readily be understood how different waters have different degrees of purity according to their source. Thus those from limestone take up not only lime, but often contain the products of the decay of organic materials which have, in the shape of fossils of plants and animals, been enclosed in it; while waters flowing over such rocks as the trap-rocks of the Scotch mountains, or the Laurentian of Muskoka and northern Ontario are remarkably free from both mineral and organic materials. Similarly, wells which receive their waters from soaking through a surface soil or a subsoil rich in organic matter, whether animal from the excreta and refuse collecting so readily in a town, or vegetable from the decaying roots of plants in the soil—often contain abnormally large quantities of organic materials. Such is the condition that we have seen present in the olden time; such, indeed, is very frequently the condition present in very many of the waters of all our Canadian towns where no thought is ever taken of the few simple facts which must convince all that sewage from closets, refuse, and house-slops is continually percolating towards the wells. Now I have already pointed out what is the *rôle* played by organic matter in water. It is that of promoting the development of microscopic beings of various kinds. Such are most undoubtedly present in decaying mould at the surface of the ground, and in open moist soils, and so are borne along with the water, since experiments carried on by the National Board of Health of the United States have shown that water percolating through 120 feet of pure sand in a tube does not lose all its suspended particles and bacteria.

But one important fact is that different forms of organic materials supply food for different forms of bacteria; while the unfortunate fact remains that it is the bacteria similar to those found in the blood of patients affected with some contagious disease, which develop in waters contaminated with sewage.

Now, applying these facts, it becomes this assembled audience to ask, what are present in their existing and prospective water-supplies. If the public water supply be thoroughly good, it will be most desirable that every household be supplied with it, since, with houses situated in one range above another on the hill-sides, the danger to the wells on the lower grounds of being contaminated with sewage from the higher ground must be very great indeed. That many here could point to undoubted cases of sickness from such a cause is most probable, while the comparative immunity from disease of the people of Paris is no doubt due to the town being less closely built than many others. But if the soakage of water containing filth into the soil is productive of disease, no argument is needed to show the advisability of its removal. The whole story of Glasgow given you to-night must supply our argument and our *methodus operandi*.

That the adoption of a systematic method of removing the filth and excrement regularly from the towns, at least weekly in the summer and fortnightly in the winter, is most desirable, has become evident to all who have listened to-night. The whole question becomes now one of expense. We have seen, however, how a large scavenging system is worked in Glasgow. With much greater ease is it worked in a smaller place, since the distance of transportation to the suburbs is much less, while every town in Canada is so situated that it will find an unlimited market for its refuse to be used as a fertilizer.

Applying the principle adopted in many British cities and towns, such as Leeds, Birmingham, Manchester, Glasgow, and, amongst smaller places, Cockermouth, Warrington, Salford, Oldham, Bristol, etc., I would quote from Dr. Buchanan's report under the Local Government Board, where I find a detailed account of the expenditure for a village of 1000 inhabitants, where the dry-earth system of closets is introduced. He says that in such a case an original outlay of £250, and a continuous weekly expenditure of £4 15s., would be necessary—dry shed and furnace, one horse, two men and boy, purchase of earth, etc. Thus the amount would be about £260. The manure got would equal 730 tons, and its production would cost 7s. at the above rates. Thus the system is practically self-supporting.

But, ladies and gentlemen, I must conclude these remarks. If you have in any degree been pleased, I shall be pleased; while, if you have received any information which may be of practical benefit I shall be gratified. The subject which has become my special

mission is indeed a large one; one which has a sort of living interest for us, as it has been for men for thousands of years. Yet how much was needing to be done, and how comparatively little through all these centuries has been accomplished! The great difficulty hitherto, and that which will ever be its drawback is that health is a matter of prosaic detail. Now let us look at it a moment. What does it all mean? It means the attention to every detail which enters into the daily life of man, from the cradle to the grave. It cannot be bought. Nature in no way can be bribed; nor does she allow any individual creature to depute the task of guarding its own health to others. She has her laws; they are made to be obeyed. In no case since their execution is best, shall their transgression be devoid of the penalty. There she stands, and bids every being perform his appointed function in the universe; upon him who disobeys she is merciless and deals pitiless justice; but to him who loves and searches out her laws to obey them, she is the kind universal mother.

Are examples wanting? The dissolute father deprives the innocent mother, of love, consolation, food, warmth, clothing, and fresh air. The puny offspring pays the penalty of her misfortunes and his faults, and dies. The settler disregards the part played by forests in attracting rains, and only seeks for more cleared land. The rains decrease annually and become irregular; the pastures are dried out in the summer, and the winter winds extend almost to the summer. The merchant labours with earnest and honest endeavour for competency, wealth and position; he draws upon the reserves of his mental and physical system, he obtains what he has labored for but has not health to enjoy them. His wealth is not health.

But after all, viewed correctly, there is something truly heroic about the work of every one, not only in learning but also in endeavouring to perform what is best for developing the powers, energies and capabilities which he has inherited, and whose work will be best for the onward progress of the race. The great trouble seems to me to be that most of us are trying to think and live after the manners of one, two or. more centuries ago. Most that we obtain from these olden times is some romance, in which moat, drawbridge, turret and barbican are the background, and in the foreground is the lone maiden of high degree, whose returned crusading lover storms the wall and rescues her from captivity. Now, if we are going to be fair with ourselves, we ought to dip down a little deeper into that history of past times, when we shall find that for one such pair of lovers there are a hundred miserable serfs, whose duty it is to labour for these two and that for one life saved, by patriotic warfare, there were a thousand lost by the frightful plague and small-pox. In these romances, moreover, it is so pleasant for us to dream our dream, and flatter our idle fancy by imagining ourselves the maiden of high degree or her noble chevalier lover—for who indeed would ever think of being a Dame Gillian, or even the growling old falconer Raoul, or any other churl? But the fact is that we are either too thoughtless, too indolent, or too much the creature of circumstances to endeavour to think of throwing poetry and romance into our own little lives. We unconsciously seem to conclude that poetry and romance are something we could all write or play parts in if we were properly placed in appropriate circumstances; but we forget that the very derivation of the word poet is that of one who creates; in fact, that poetry is from the man himself, not from his surroundings. Where did Burns find his materials for that sweet lyric "Wee, modest, crimson-tipped flower," but amongst the stubble? Truly has Milton said, "Let him who would write heroic poems make his life heroic."

If all this be true why then shall we not see something more than the prosaic and disagreeable in the following out of nature's laws, remembering

"That love is nature's final law!"

Though poetry and romance have lent a charm to the sun-lit hills and the shadowy vales; though the winding streams and the foaming billows have given to us sweet lyrics; though the returning seasons of nature's year have had their beauties sung, yet the deeply hidden and more potent forces of nature have as yet been severely left to the practical prose of the scientist. Yet is there not real poetry in the tremulous rays of light reaching out through the unmeasured ether to the cloud-capped summits, reflecting their

radiance through the vapoury air ; comes there no heart inspiration from the thought of the inherent energy of the watery atoms, wearing away through their combined forces the earthy particles into meandering river courses ; and shall not more than prosaic interest attach itself to the study of the cyclic forces, which, starting from mother earth, with her mineral and organic molecules, create the blade, and stalk and grain, pass thence to animate and build the million forms feeding upon them, perform here their purpose and again through the action of these same forces of air, and heat and water decompose into their original constituents and become again the first links in the unbroken circle of physical energy?

It is not base, it is not coarse, it ought not to be unpleasant to examine into, to know, and to utilize all the physical facts which, whether we will or not, enter into the everyday life of man as an animal, and in his relation to the world of nature around him. In his being, in the truest sense, in harmony with his environment means physical well-being and physical happiness; and to-night, ladies and gentlemen, in a sort of parable, where ocean mist, mountain peak, rapid burn, highland loch, and a toiling, populous city have been the figures, I have endeavoured, and I trust not vainly, to show you how man, crowned with God-like reason, has all Nature's forces at his command, that he has relations with and uses for all, that there is nothing which is too low or too little to be beneath his notice, and that, more than this, he has no right, nor can he afford, to despise or neglect any of them. Certain it is

> "That nothing walks with aimless feet;"

and the more we study and contemplate Nature in all her works, where

> "So variously seemeth all things wrought,"

the greater will be the pleasures of existence, and the better shall we be able to follow, ourselves, and teach to others, our duties and relations in every sphere and position of life.

ALPHABETICAL INDEX.

(The pages indicated by Roman numerals refer to the pages of Part I. of the Report, while those indicated by Arabic numerals refer to Parts II. and III. of the Report.)

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Note.—Through an inadvertent delay in obtaining the manuscript of Dr. J. G. Bray's (Chatham) paper on "Malaria," read at the London Sanitary Convention, it has been omitted from the Table of Contents (p. ix.). It will, however, be found in its proper place, p. 305 *et seq.*

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